JAN 16 1915

THE HEATING AND VENTILATING MAGAZINE

Vol. XII. No. 1
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NEW YORK, JANUARY, 1915.

Publication Office:
1123 Broadway, New York

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 12 E. 42nd ST. 188-200 FRANKLIN ST. BOSTON.

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COPPER AND GALVANIZED IRON
SIMPLE, SYMMETRICAL, STORM PROOF, SUCCESSFUL
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Knowles Mushroom Diffuser and Air Controlling Head (Improved Notch Style) ADJUSTABLE

Placed under seats in all auditoriums. A perfect Air Controlling Head and Diffuser, assuring uniform distribution

This device is not a roof ventilator.

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Successor to Geo. E. Knowles 9 Church St., New York

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REG. U.S. PAT. OFFICE.
Recording Thermometers

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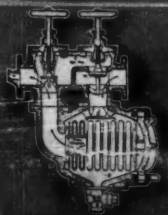

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Will Keep Oil Out of Your Boiler
Regulating Valves for Water, Steam, Air
Ross Valve Mfg. Co. Troy, N. Y.
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FOR INSULATING UNDERGROUND STEAM PIPES
SIMPLE DURABLE EFFICIENT
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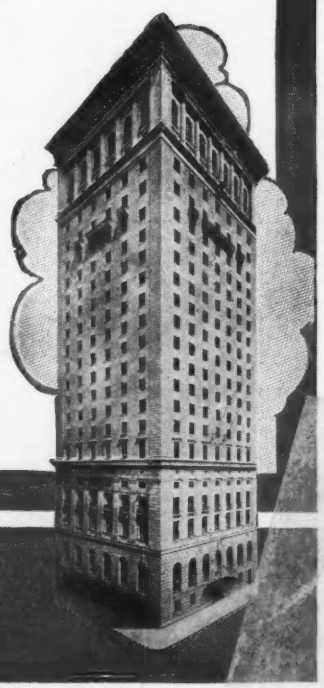

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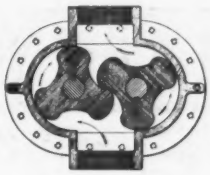

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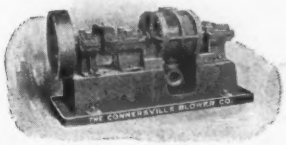

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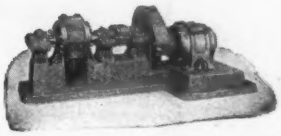

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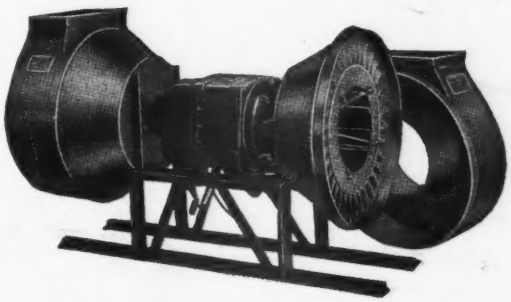

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Manufactured Exclusively by
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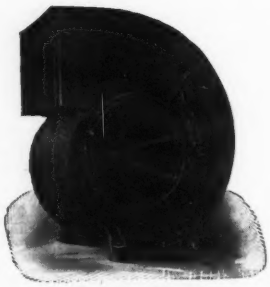

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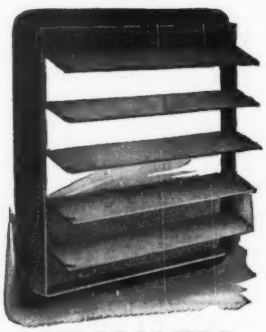

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Lavatory or
Workroom.

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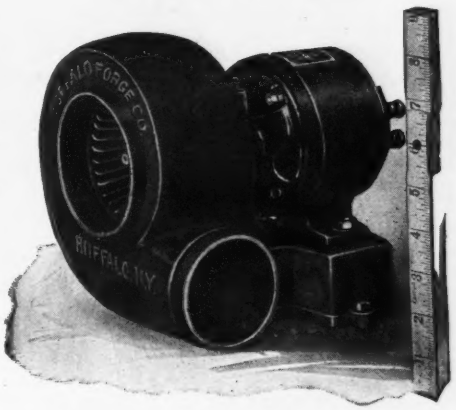

is at your service. A high-efficiency, multiblade fan, practically noiseless in operation. Delivers large volumes of air at low pressures. Unexcelled for individual ventilating equipments.

Made in three sizes. Capacities ranging from 90 to 500 cu. ft. of air per minute; 8¼ to 15 in. high. Our catalogue 181-36 describes them. Shall we send it to you?

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RETURN LINE VALVE

For Low Pressure, Vapor and Vacuum Heating Systems

GUARANTEED FOR FIVE YEARS

Will Not Leak Steam
Most Economical Valve in Use
Sealed Adjustment
Absolutely Noiseless
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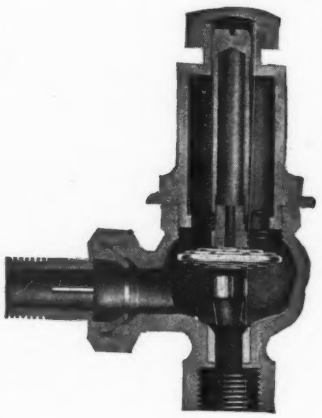

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WITHOUT LOSS OF STEAM

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are used to handle returns to boilers in hundreds of low pressure heating systems, materially reducing fuel consumption.

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BRASS FITTED PUMP

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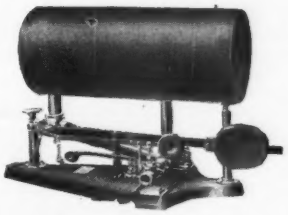

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While you cannot **prevent** water in **your** steam—condensation—you can make it **pay.** A heat unit **saved** is a heat unit **made,** and every heat unit in your plant's condensation can be utilized to an advantage in favor of the coal pile if it is saved and returned to the boiler. The most direct, efficient and economical way to do this is to install the

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Write us today 181

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Graduating Vapor
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The Best Heating System To Sell For Fine Homes

These Advantages Sell it Quickly to the Owner.

1. Mild and healthful heat furnished in just the right amount to suit all weather conditions.
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MILD HEALTHFUL HEAT
When You Want It
Where You Want It
In Just the Right Amount

Jolly Up "Slats"

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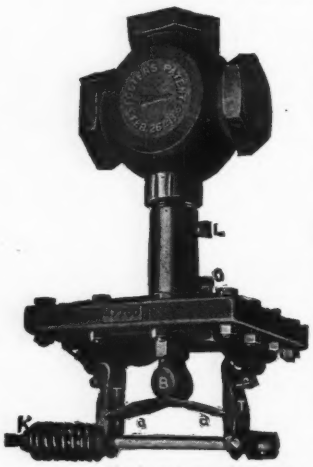
For Safety, Sureness of Operation and Durability

FOSTER PRESSURE REGULATORS
FOR STEAM HEATING SERVICE

(Classes "Q" and "Q H")



lead the way. Designed especially for steam heating, and suitable for vacuum systems, for delivery pressure of from 1 to 15 lbs.

We make several types of pressure regulators—those shown in the illustrations here were designed particularly for steam heating service, and they are very sensitive, reliable, high grade in every particular and superior to other makes in construction and workmanship. There are no weights or close fitting pistons, and are easily adjusted to the desired pressure between 1 and 15 lbs. Made in sizes ¾ inch to 2 inches inclusive, composition body. Larger sizes are fitted with composition renewable seats.

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These Valves are fully explained on Pages 29 to 33 of our 1913 Catalogue, No. 20.
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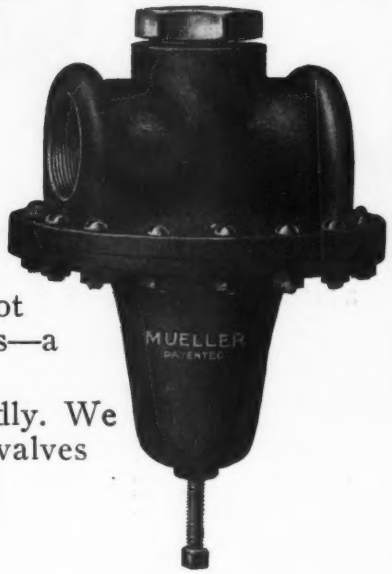
Superintendents } **Give thought to this.**
Engineers

MUELLER

Reducing and Regulating Valve.
The best all-around Valve made.



The solution of your pressure problem is not a hard one—it's easy. The answer is—a **Mueller Valve.**

We are not talking to you unadvisedly. We have a line of pressure reducing valves that are—

Right in principle
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Their efficiency and reliability have been successfully tested in thousands of cases.

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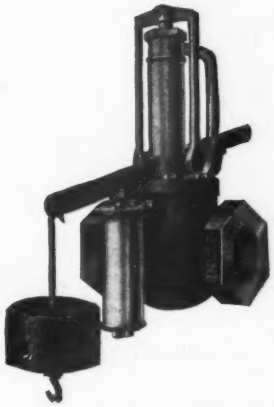
DAVIS VALVES

for the

Automatic Regulation of Pressure



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For nearly forty years Davis Valves have been held in high esteem by men of experience who specify, install and use valve specialties.

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J. C. HORNUNG, Engineer

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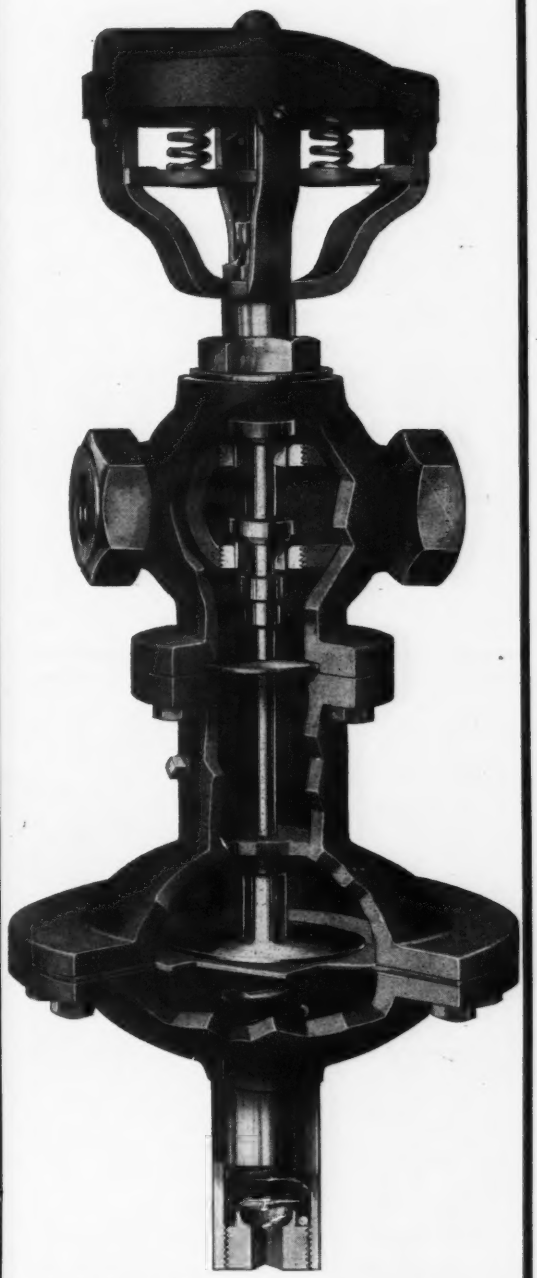

Pressure and Temperature Regulators for either Steam or Hot Water

These Valves are furnished with or without the temperature control. Fully 500 valves in use and ***not one*** *Failure.*

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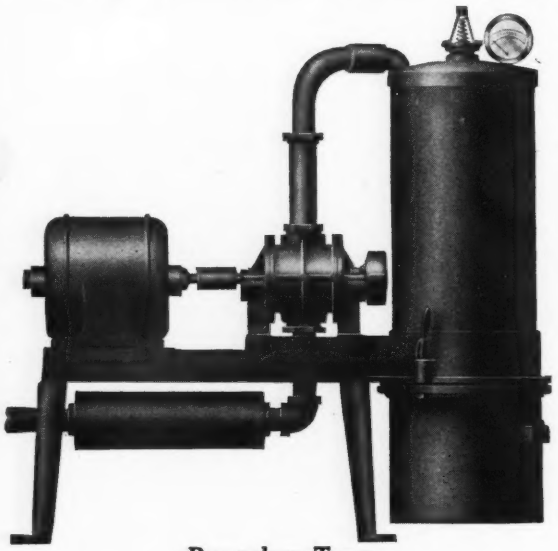

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No Matter How Large We Make It

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It is a CLEANER that CLEANS.

BECAUSE
It renovates everything in the building from cellar to garret.

BECAUSE
It is Sanitary, no dirt or dust is blown into the open air to jeopardize the health of your neighbors.

BECAUSE
It is the simplest, most durable and economical.

BUNGALOW—TYPE. Price complete $150.00 F. O. B. FACTORY.

UNITED VACUUM APPLIANCE COMPANY, Connersville, Indiana

MOLBY HEATERS

Manufactured Under Surrell Patents

Built on Down Draft Principle Under Surrell Patents.

Burns cheaper grades of fuel, economical, requires little labor.

Represents large profits to the Fitter and Satisfaction to the Owner.

Write for catalogue

E. C. MOLBY

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The Heating and Ventilating Magazine

VOL. XII. No. 1

Contents for January, 1915

Page

Kitchen Ventilation for a Modern Hotel 13
Equipment of the Hotel Biltmore, New York.

Systems for the Engineer and Contractor, III ..... *Thos. Barwick* 18
Practical Suggestions, with Forms, for Increasing Business Efficiency.

The Air We Breathe—A Study of Temperature, Humidity and Dust Content ..... *Thos. Hubbard, M.D.* 22

Electric Heating in Seattle 25

District Heating ..... *S. Morgan Bushnell* and *Fred B. Orr* 27
1—Origin and Development of District Heating.

The Consulting Engineer 39
Does It Take a Greater Amount of Heat Initially to Heat with Live Steam Than with Exhaust Steam?

American Society of Heating and Ventilating Engineers 44
Programme for Annual Meeting.
New Members.
Lecture Before New York Chapter on "Heating the Skyscraper and Its Problems."
Illinois Chapter.
Massachusetts Chapter.

The Weather for November, 1914 46
New York, Boston, Pittsburgh, Chicago and St. Louis.

Horizontal Air Currents Advocated for Room Ventilation 48

Correspondence 48
Lift Fittings and Lift Pockets in Vacuum Steam Heating Work.
Radiation as Figured by Different Rules.

Work of the Heating and Ventilating Division of Cleveland for 1914 50

The Needs of the Heating Profession 51

N. A. S. O. Standard First Aid Jar 52

Plans of International Engineering Congress 53

Ownership of the New York Steam Company 53

Bibliography on Air Conditioning 53

Current Heating and Ventilating Literature 53

Test of Vacuum Cleaning Plant 60
Harvard Freshman Dormitories.

Central Heating Trade Notes 61

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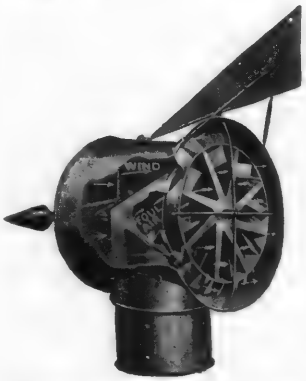
Ventilators



Fan Suction

Power Bills?

Let the air that passes over your building furnish the power to ventilate it. The **BICALKY** does this regardless of weather conditions or temperature.

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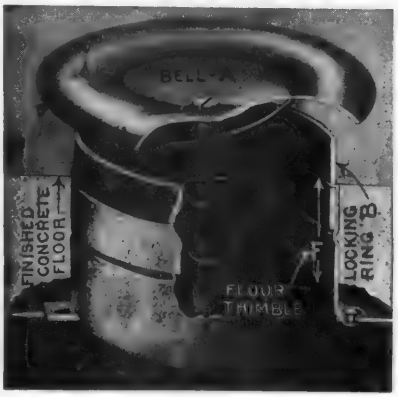
Toronto Representative: John T. Wilson, Limited, 89 Jarvis St.
Wanted—Agent to handle "Bicalky" goods in New York Territory



The Bi-Cal-Ky Mushroom Vent Cap and Floor Thimble Used in Floors with Fan System in Theatres, Schools, Churches and Public Buildings

is far superior to any other cap and thimble on the market in simplicity, appearance and efficiency, as well as low in price.

The BI-CAL-KY cap acts as a combination damper and diffuser and the screw as a support, adjusting rod and lock for the cap. The cap is raised or lowered by simply turning the screw. This increases or decreases the opening through which the air escapes, thereby insuring an equal distribution of air at the periphery of the cap.

Note projection of cap which deflects the air wards the floor, thereby eliminating draughts. Compare with other caps.

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK JANUARY, 1915

Kitchen Ventilation for a Modern Hotel

EQUIPMENT OF THE HOTEL BILTMORE, NEW YORK.

The Hotel Biltmore, in many ways the last word in hotel construction, occupies the entire block bounded by Madison avenue, 43d and 44th streets and Vanderbilt avenue, New York. It is said to be the only hotel in the world that has every room a real outside room.

The plot on which the building stands was known for many years as Commodore Vanderbilt's grazing field. Time after time efforts were made to purchase this valuable piece of property, but during the commodore's lifetime, he would never place a valuation upon it. It was assumed by many that the grass plot would always remain, but when the new Grand Central Terminal was built, the owners decided to put the plot to use.

The architects, Warren & Wetmore, were given unusual opportunities to provide not only a house of safety, with all the necessary fireproof features, but also a house of wholesome living conditions, and they made the utmost of their opportunities.

The heating and ventilation of this hotel is one of the most successful installations ever made in this country. It was designed by Clyde R. Place, mechanical engineer for Warren & Wetmore, and installed by Baker Smith & Co., New York.

While the installation is replete with many interesting details, the present article will only attempt to give a brief outline of the heating system and a description of the ventilating equipment of the kitchens.

THREE SEPARATE HEATING SYSTEMS.

The heating system for the hotel is operated on the principle of a down-feed hot water forced circulation, with main return loops at the bottom, with the exception of the low-pressure system, which has supply and return loop on same level.

The installation is divided into three separate systems, each operated independently from one service plant, located at 50th street, between Lexington avenue and Park avenue. The three systems are known as the low pressure system, intermediate pressure system and the high pressure system.

The low pressure system does all the heating work from the fifth floor down, while the intermediate pressure system heats the hotel from the eleventh floor down to the fifth floor, and the high pressure system takes care of all the heating above the twelfth floor, up to the pent house on the roof.

Each system is absolutely independent of the others, with no cross connections between any of them.

The hot water for the heating comes to the hotel and returns therefrom in six 18-in. hot water heating mains, by means of forced pump circulation from

the pumps and heaters in the service plant, and are laid out on the loop principle, thereby insuring the flow of the heating water in one direction.

METHOD OF DISTRIBUTION.

The method of distribution is as follows:

The supply of water for the hot water heating passes from these main subway loops into the building in sub-loops, which rise up through the building and loop horizontally about the building. From these sub-loops the riser branches are taken and the return riser branches are then collected into the return sub-loops which are arranged similar to supply loops, but in the reverse direction, and these sub-loops are carried down through the building and connected into the main return loops.

After the water has passed from the supply sub-loops through radiators, coils and stacks and has, therefore, done its work for heating, it passes into the return branches, thence into the building sub-loops for the returns and then into the large returns into the subway. The travel of the water is always in the same direction.

The radiators throughout the hotel are of a design and construction suitable for hot water heating under forced circulation, and are of heavy construction, made of grey cast iron with extra heavy right and left hand threaded nipples at

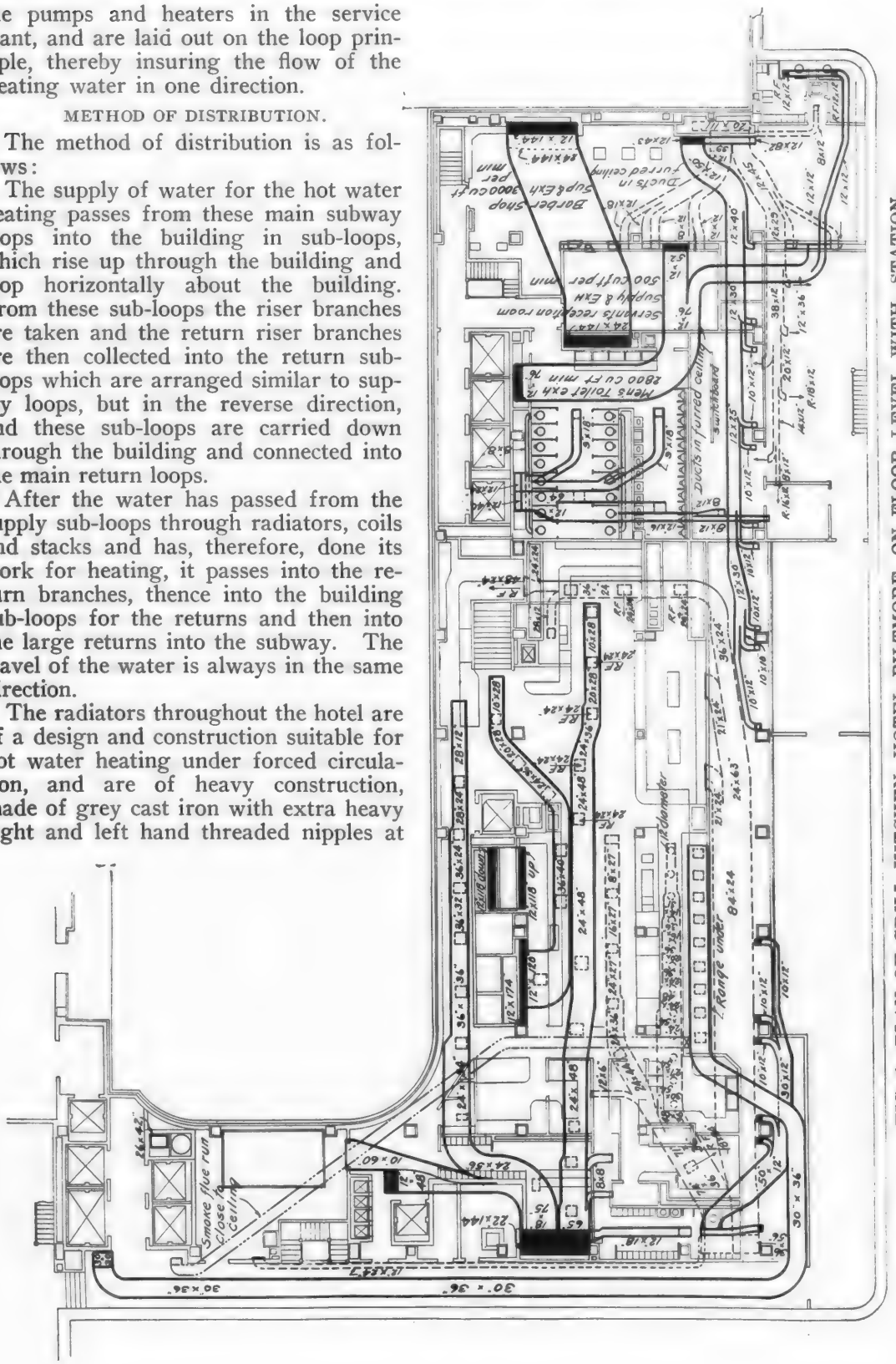

Barber Shop
Sup & Exh 3000 Cu ft per min
Ducts in furred ceiling
Servant's reception room
Sup & Exh 500 Cu ft per min
Mens Toilet Exh 2800 Cu ft min
Ducts in furred ceiling
Switchboard
Refrigerator
Range under
Smoke flue run close to ceiling

FIG. 1—PLAN OF GRILL KITCHEN, HOTEL BILTMORE, ON FLOOR LEVEL WITH STATION.

MAIN KITCHEN, BROILING DEPARTMENT, HOTEL BILTMORE.

GRILL KITCHEN, SERVING PANTRY HOTEL BILTMORE.

top and bottom connections with standard 2½-in. sections. Each radiator has been tested to a test pressure of 400 lbs. per square inch and found to be tight at this pressure.

Where radiators are more than 16 sections long, an extra leg is provided, and each radiator has a valve on both the supply and return ends, with a suitable tapping for a brass screw plug for air adjustment on the end section.

The entire heating system is arranged to free itself quickly and readily of all air, by having on the return end sections of radiators a small brass air relief cock key which can be used if the radiator becomes air bound. On the top of each riser and on the top of each supply of each pressure system is an extra heavy ¾-in. pipe connection, which is connected to 1¼-in. air main carried around parallel to the main supply loops and ending with an open connection in the respective expansion tanks in the building.

Wherever there is any change in elevation of the horizontal loop to form air pockets, these pockets have a relief valve.

All expansion and contraction in the piping system is taken care of by swings and bends without using sliding joints.

All of the risers have loops which are anchored in proper locations so that no part of the piping is subjected to an expansion greater than ½-in. with the temperature of water from 70° to 210° F., and in the horizontal lines no greater expansion than 1 in. under the same temperature conditions.

All piping is covered with 85 per cent. carbonate of magnesia and is canvas jacketed, painted and then banded.

KITCHEN VENTILATION.

Particularly notable and interesting are the Biltmore's kitchens, all of which are located above ground adjacent to the dining rooms they supply, and planned upon a scale so comprehensive and so unusual as to establish a new mark in this important branch of hotel development.

BANQUET SERVICE KITCHEN, HOTEL BILTMORE.

Efficiency and sanitation completely dominate the kitchen plans. From the elaborate ventilation system, which eliminates all excess moisture and odors, to the smallest detail of equipment, everything speaks the thoroughness and care exercised to provide ideal working conditions, and the importance attached to the maintenance of a sweet and wholesome atmosphere in the departments given over to the preparation and care of food in this great hotel.

The ventilation of the hotel itself consists of two separate and distinct systems, viz: a fresh air supply and an exhaust air system.

The fresh air supply consists in drawing fresh air through screens or washers and discharging the air through a system of galvanized ducts to the several rooms and apartments in the hotel.

The vitiated air exhaust system consists of drawing all impure air from the different rooms by means of ducts and large vent shafts, at the top of which the

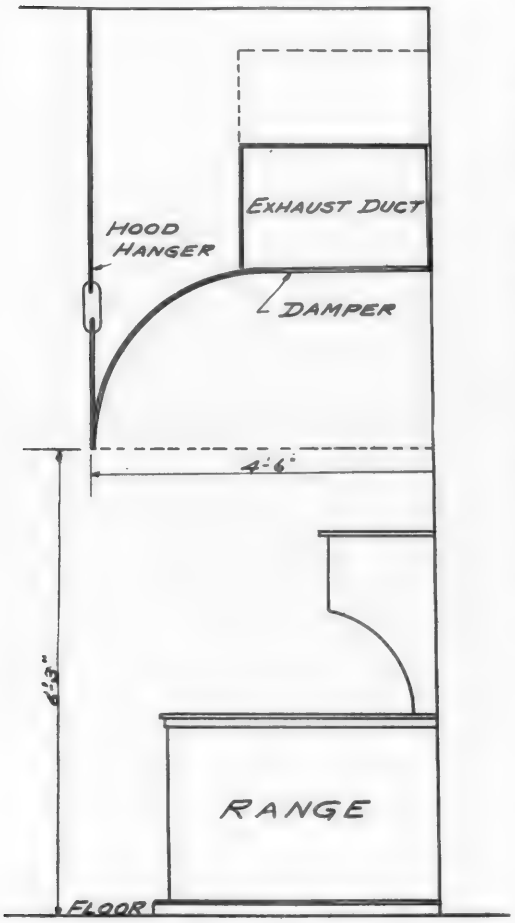


FIG. 2—DETAIL OF EXHAUST DUCT PLACED OVER EACH RANGE, SOUP AND STRAINING KETTLE.

exhaust fans (which throughout the hotel are motor-driven) are placed on the roof in the pent house, and discharge the air into the open.

Fig. 1 shows a plan of the grill kitchen on the floor level with the station, with the fresh air ducts shown in heavy dotted lines, while the exhaust air system is shown in heavy full lines.

As for the dampers, the general rule

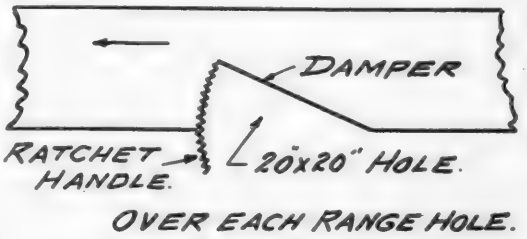


FIG. 3—DETAIL OF RATCHET DAMPER PLACED IN EXHAUST DUCT OVER EACH RANGE HOLE.

is that no branch duct is taken from the main flue without an adjustable volume damper made of No. 22 gauge galvanized sheet iron with indicating quadrants.

Fig. 2. shows a detail of the exhaust duct placed over each range, soup and straining kettle and at suitable intervals there is placed, as shown in Fig. 1, a ratchet damper, which is shown in detail in Fig 3.

In front of the kitchen ranges throughout the hotel and other heat-giving appliances, there is provided a 12-in. fresh air supply, with an adjustable swivel joint connection made of Russia iron with end flare and damper with set screws. A detail of this attachment is shown in Fig. 4.

All the fresh air, before being delivered to the kitchen, is washed by an

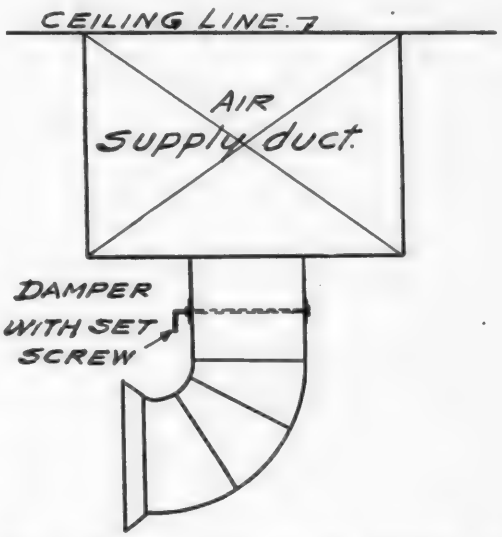


FIG. 4—ADJUSTABLE SWIVEL ELBOW IN FRESH AIR SUPPLY PIPE, PLACED IN FRONT OF KITCHEN RANGES THROUGHOUT HOTEL.

Acme washer, which is designed to remove at least 99 per cent. of all atmospheric contents not gaseous or aqueous. The amount of water used is approximately 1 lb. for every 50 cu. ft. of air passing through the washer at a velocity not more than 450 ft. per minute.

The fans furnished for the ventilating were of American Blower Company make.

The general contractor for this hotel was the George A. Fuller Company, of New York, while the entire kitchen equipment of the Biltmore was planned and installed by Walter J. Buzzini, Inc.

Systems for the Engineer and Contractor

PRACTICAL SUGGESTIONS, WITH FORMS, FOR INCREASING BUSINESS EFFICIENCY

By THOMAS BARWICK, C.E.

(Concluded from December issue)

USE OF DUPLICATING REGISTERS IN KEEPING CONTRACT COSTS.

In the keeping of contract costs there can be some reform from the methods usually followed and if the duplicating registers are used the matter will be further simplified by posting direct from them the cost value instead of the items themselves, thus saving time and considerable annoyance.

In the same way the sheet shown in Fig. 10 could be used as a verified charge sheet where used as such to verify invoices for materials sent directly to the job, instead of charging them from the shop order or the invoice with the order number. In some cases, this will avoid duplication and the charging of more material than is actually received. Items of specialties can be charged direct to the contract book from the invoices when checked by the checking slips.

FORM FOR GROUPING ITEMS OF A CONTRACT.

The method of grouping items of a contract in the charge book is of importance, especially in estimating on future work. In this grouping a suggestion may be made and forms are submitted that will appeal to many as being simple and yet covering items that interest the contractor. There are two leaves covering the various items, one A and one B, as shown in Fig. 11. In these forms, both will be required for a contract. Form A will only require one sheet in most cases, while form B will be required in duplicate or more, as the period of the work requires. In the arrangement as shown the matter is condensed as much as possible. Items which are usually sublet and miscellaneous work, such as painting, trucking, oils, etc., are placed in the proper column and can be totaled as sundries when not otherwise arranged for in the divisions.

The sheets should be ruled and indexed as shown on both sides. They will, therefore, not be cumbersome, and as the most interesting items are noted at the top of the page, such as the articles, etc., with the amount allowed in the estimate for such articles, it is easy to make calculations as to where the contract stands at all times and especially in asking for payments on account.

The form as shown would be operated as follows: The weekly labor account would state in the first column on form B the date and the word "labor," and the amount paid would appear under the "labor" column. If any expenses were incurred, that item would be stated in the first column as "expense men," and the amount placed in the column under "remarks." The same course would be followed with any materials, such as pipe. If taken from stock, for instance, the cost would be made up on the slip from the duplicating machine, with a file number, and this number would be posted under column F for identification and the cost placed under "pipe," and so on. The posting of accounts in the ledger for further identification would appear in

LEDGER NO._____ PAGE INDEX NO._____

CONTRACT CHARGE FOR_____

STARTED_____ JOB NO._____ FINISHED_____

SUNDRIES				ALLOWANCES															
PURCHASED	L.	O.	F.	BOILERS & CASTINGS		MASON WK. CARPTR WK		TANKS & PUMPS		ENGINES MOTORS		BLOWERS FANS		SPECIAL-ITIES		MISC.		REMARKS	

LEDGER NO. _____ PAGE INDEX _____

CONTRACT CHARGE FOR _____

STARTED _____ JOB NO. _____ FINISHED _____

SUNDRIES					ALLOWANCES IN ESTIMATE							
PURCHASED	L.	O.	F.	PIPE	FITTINGS	VALVES	RADIATORS	COILS	LABOR	GALV. IRON		REMARKS

CARRY FORWARD

FIG. 11B—FORM B FOR GROUPING ITEMS OF A CONTRACT.

column L or, if the amount was charged from the order slip, the order number would be placed under column O.

Likewise on form A, the items charged from invoice would be charged under ledger account L, and the checking slip would show the number in column F.

If any remarks are to be made they can be placed in the "remarks" column. This applies to cartage on boiler, freight, etc., and, as the items are not numerous, they can be quickly totaled.

The form B could be cut, as shown at the top, so that the general job index would be seen on the page of form A, while the B sheets would have subsidiary additions, such as "a," "b," etc. With the above forms the keeping of the records is considerably simplified and a record made of the state of the work at all times, with reference index for verification.

COMBINATION PAY ENVELOPE AND RECEIPT.

The payment of the men is another consideration that should be entered in such a manner that verification is possible, especially where the payments are made on account of work done as extra work. This can be handled in conjunction with the time-cards shown in Fig. 7 to verify the acceptance of payment by the workmen. A suggested pay envelope is shown in Fig. 12 which, when filled out, can be filed for future reference. In the form shown the envelope should have the receipt on the gummed flap so that it may be torn off and signed and then returned to the office. There the signatures should be compared with the time-card and filed.

No. 177 A
PAY ENVELOPE
Tear off annexed receipt and give to Paymaster. Keep this CHECK in case of error

No. 177 A DATE _____
VAN PUSHER HEATING CO.
9 WATER ST. CORNERSTONE, IND.

WORKMAN _____
JOB _____ OCCUPATION _____
AMOUNT _____
RECEIVED PAYMENT _____
This Slip return to office receipted

FIG. 12—COMBINATION PAY ENVELOPE AND RECEIPT.

By numbering all envelopes and receipt stubs, it is possible to rectify any errors or claims and, where payment is made for work other than contract, they will serve as evidence to substantiate invoicing.

SOLICITOR'S OR ENGINEERING CARD.

There is another form which it would be advisable to have in shops where solicitors for work are employed. It is often valuable to a contractor to know how much time it has taken to get a contract as well as what time is spent in addition to that of the actual workmen. This could be known as a solicitor's or engineering card. The value of such a record lies in the fact that it gives some idea of the effort spent in getting the work and, at the same time, acts as a ready reference as to the progress of those in charge. It may be continued after the closing of a contract as an

PROJECT _____ VALUE _____
AT _____
ARCHITECT _____
ADDRESS _____
SOURCE _____ DATE _____
CLOSED BY _____ EXTR. _____ LOST _____

DATE	REPORT OF PROGRESS	SIGNED	EXPENSE	

FIG. 13—SOLICITORS' OR ENGINEERING CARD.

engineering slip, showing the efforts until the job is completed.

These cards are easily filed and do away with the time spent in writing memoranda in pocket books, as the cards can be filed and refiled under dates when the proposition needs attention, all of which will show on the record.

By making the proper markings on such a card, it can be shown that the salesman or solicitor visited the architect and received the information that in about three weeks the architect would be ready. Therefore, the card was placed in rotation for that time in the rotation of other similar cards. If the solicitor secured the plans or a chance to estimate at that time, he would mark on the sheet "received plans," and if it was necessary to turn over the plans to the engineer for estimating, he would so state on the record. He would also give the card to the engineer who would state when he had finished the estimate and returned it to the solicitor. Further progress would be noted on the card until the job was either closed or lost. If closed, it would then be returned to the engineering staff and the record would show the onward progress until the job was completed in that department. If one card did not cover all of the efforts, then in the space shown the number of the extension could be given. Expenses, such as drafting, materials, etc., could be marked on the card and the record complete charged to the job or office account, as might be desired.

The filing of these cards can be done in a small cabinet, with index cards ot some different color, and with weekly or monthly periods for those that are active, while the cards with "lost" or "completed" contract data can be filed with any other data that were used in the operation.

LEGAL FORM OF EXPANSIBLE POCKET FOR FILING DATA.

In filing all data in connection with work to be done, such as estimates, proposals, specifications, plans, and other data, it is best to use the usual legal form of expansible pocket, as plans can be folded, with the exception of the original tracings. These are kept in better shape either flat or in a roll. Prints should be made from the tracings for folding purposes and they will be found much more serviceable if they are folded so that they will open like an accordion, as in that case, the part to be inspected first can be seen without opening the whole sheet. This will save time.

Small things, such as money receipts or slips like those shown in Figs. 7 and 13, may be strung on strings for future reference.

With the system here detailed there should be considerable time saved both in the management and workmanship and a great saving from losses caused by mistakes and misapplication.

The Air We Breathe—A Study of Temperature, Humidity and Dust Content

By THOMAS HUBBARD, M. D.

A forceful talk on what is often considered a dry subject, in more senses than one, was made by Dr. Thomas Hubbard recently when he spoke before the American Laryngological Association. Some of the more striking portions of Dr. Hubbard's address are reproduced herewith:

Fire was man's first friend—that is, conservation of body-caloric by artificial heat started the evolution of the higher nervous system, but, to carry this logic to an absurd extreme, one cannot say that mental precocity is in direct relation to the ingenuity in inventing and utilizing heating apparatus. Based on this theory the inhabitants of the Northern and Middle States might claim, for instance, that they are at least 10° more progressive than Europeans. Heating

and ventilating contracts in public school buildings specify 70° F. in America, and in England 60° F. They might raise the question as to which temperature-standard favors the more rapid expansion of the intellect. Are we really 10° hotter on the trail of Truth?

It is interesting to follow the gradual change that has taken place in our own country during the past half century in artificial heat standards. In 1820, American text-books gave 50° to 55° F. as the healthful, comfortable temperature of the living room and nursery (and I should add in passing that the natural relative humidity, taking into consideration the methods of heating,—luminous heat and direct radiation, the open fire-place, ovens and the Franklin stove—would probably be about 40%). In 1850, the comfortable temperature was stated to be 62° F. and in the next thirty years it was raised to 72° F. Now should we consider this 17° change (55° to 72°) a triumph of man's increasing dominance over the elements, or are we on the contrary 17° decadent in physical vigor? Our ancestors of two generations ago would have considered 72° the proper temperature for the aged and infirm, but not for youth. This whole record is a commentary on ingenuity in invention and extravagance in burning up natural fuel resources. (The base burner and hot air furnace were invented about 1840.)

Again I must mention humidity in this connection. The moisture in the air of a building at 70° F. (this applies particularly to public school buildings and places of sedentary employment) would naturally be below 25% relative. Therefore, if we were to state that in the period from, say, 1825 to 1875, we reduced the standard of humidity from 40% or 50% relative to 25% or less it would be a more significant fact from the hygienic standpoint than to call attention to the 17° increase in temperature during that period. In other words, we have worshipped a false god of comfort,—Fahrenheit. Rather too mercurial!

NATURAL VENTILATION DIFFICULT WITH LOW INDOOR HUMIDITY.

The difficulties of natural ventilation (that is, by windows, etc.) are immensely increased at 70° with 25% relative humidity standard. Drafts of outside air are unendurable because the velocity of the incoming air is in direct relation to the relative differences in temperature, and further, the contrast in temperature and particularly in humidity is so marked that it produces real discomfort. A stratum of cold humid air (80% relative) of considerable velocity about the lower extremities produces a disturbing local chill and the rest of the body, including the nasal mucosa, is experiencing 70° with 25% relative humidity.

The essential fact, to which all will agree, theoretically and from experience, is that a standard of 70° and higher, with necessarily low relative humidity, makes efficient natural ventilation almost impractical. At a temperature of 65° with humidity 40% to 50% relative, the perception of the drafts of natural (window) ventilation is less. It is not dependent on merely the difference of 5° in temperature. The water vapor in the air of the room is an equalizer of heat radiation. It tempers sudden changes. The figures, 70° with 25% relative humidity and 40° with 80% relative humidity—that is, the room temperature and the inflowing air from an opened window—graphically express the complex disturbance (we may call it shock) of the heat-regulating functions, the same having been made more delicate by being habituated to the hot, dry atmosphere.

WATER VAPOR EXISTS IN AIR NOT PASSIVELY, BUT POSITIVELY.

We should study *humidity* not as a secondary ingredient of the atmosphere, but as an entity. Water vapor exists in the air not passively but positively. The vapor pressure of the air is as definite as barometric pressure. Air does not absorb moisture, but on the contrary its presence in the air in varying quantities is dependent on the relative vapor pressure. In other words, dry air coming in contact with a moist surface becomes more humid because of the natural tendency to equalize vapor pressure and not because the air is hygroscopic in the same sense that is chlorid of calcium. Keep that property clearly in mind, for this constitutes the difficulty in artificial humidification. *There is no natural at-*

traction between air and water vapor. Vapor diffuses more rapidly in a vacuum than in air. The terms "water hunger air," "desiccating air," and even "saturated air" are mere figures of speech but they are convenient and rather indispensable terms in the discussion of this subject and they should not be interpreted literally.

A few figures (not altogether dry ones) will illustrate the difficulties of maintaining a healthful degree of humidity in buildings heated to our present standard. But first a few words concerning *humidity standards.* This is a very broad subject if we attempt to consider it as applied in the industries and public buildings in general. It is better to limit the scope of the discussion to school buildings and dwellings and places of sedentary employment. The mechanical problems involved in the artificial regulation of indoor atmosphere are complex. It is impractical to attempt a perfect imitation of natural conditions.

The consensus of opinion is that 40 to 50% relative humidity is a healthful and practical compromise. As stated, the difficulty of proper humidification arises chiefly from the fact that the temperature standard is inordinately high.

Here are some of the figures: A cubic foot of atmospheric air can hold, at 30° F., 2 gr. of water-vapor. That is, 100% relative humidity. At 70° it can hold about 8 gr. of water-vapor—an increase of about 6 gr. per cubic feet, and at 80° about 11 gr. If we heat air, temperature 30°, having 80% relative humidity (an average condition in cold weather) up to 70° its relative humidity drops to about 20%. The problem presented is to add enough moisture to maintain 50% more or less at 70° F.

A nine-room house, cubic capacity about 30,000 cubic feet—air changed once an hour (about twenty times daily, the minimum rate of change consistent with warming it by indirect radiation)—would require about twenty gallons of water to be added daily to the warmed air. *About a gallon an hour.* A very considerable amount—in fact it would be quite impractical to evaporate this amount by natural methods, such as ordinary evaporating pans on registers and radiators. The evaporating pan heated by small caliber steam coils immersed in the water will impart to the air in the furnace or air ducts a sufficient amount of water-vapor. This apparatus is used in large plants with forced ventilation. The evaporating pan has been successfully adapted to the ordinary hot-air furnace—a large copper pan over the dome, the essential feature being a continuous automatic supply of water by gravitation from a reservoir outside the furnace.

The objections to live steam as the source of humidity are the disagreeable odor and the noise. Its use is limited to large buildings. The humidistat is quite practical and satisfactory in control of the artificial humidifiers, especially the steam injector type. The atomizer type of humidifier is used successfully in certain factories. The air is first dried by freezing and then a definite amount of water is sprayed into the rewarmed air maintaining any desired degree of humidity. But all this is for a visible profit, and health conservation as a commercial asset cannot command such expenditure.

It is evident that the whole problem of moistening the air to the healthful standard is made difficult and in many instances impractical by the unnaturally high temperature standard to which we have drifted. It is the last 10° that makes the trouble, and by the way we may add the fuel expense of heating a building in cold weather from 60° to 70° exceeds the total expense of raising the heat from 20° to 60° F. *60° to 65° is the "critical point" in heating air. Above that degree (65° F.) there is positive resistance due, possibly to the low humidity* and the relative cost of heating the aid and maintaining it at 70° and higher increases in a geometrical ratio. It is a strange coincidence that this "critical point" should coincide with the teachings of hygiene and it is also the standard of the greenhouse. One cannot but surmise that there is a fundamental principle which governs both. In other words 65° *is the natural maximum temperature considered from the physical, hygienic or economic standpoint.* These conclusions are worthy of consideration, for ultimately America will awaken to the foolish-

ness of extravagance, especially where there is involved corresponding health deterioration.

WHEN VENTILATION IS OVERDONE.

It may seem exaggeration to assert that ventilation is ever overdone, but I think that a few illustrations will make it evident that in certain instances such is the fact. In hot-air furnace-heated houses and in all indirect heating systems the air of rooms must be displaced by incoming warm air from once to four times or more an hour to get the proper amount of heat. In cold weather the humidity of the warmed air is near 20% relative. This is a sort of dry kiln effect and the more rapid the change of air (the more ventilation) the more effective the desiccation of all material objects in the house. Even the furniture and piano complain.

I would assert boldly that it is less injurious from the health point of view to live in an atmosphere a trifle overcharged with carbonic gas and organic vapor having at the same time a healthful humidity than to live almost continuously, as many do, in air having only 20% or less relative humidity and 70° F. and even higher temperature, however low the percentage of vitiation. *There is such a thing as too much ventilation when the process is one of gradual reduction of humidity to a point far below the health standard.* In other words, excess of carbonic acid gas and organic compounds are not the only constituents which determine the unfitness of the air of habitations.

DUST AND BACTERIA.

Dust and droplets (minute particles of moisture) are the other ingredients of the air which should be considered in this study. The atmospheric dust is as essential to life as is water-vapor. "No dust, no rain" is the axiom. We can consider bacteria and spores as dust in so far as air currents and moisture are concerned. Dust dissemination in the air of the room is determined by drafts and humidity. Desiccation destroys most bacteria rapidly but spores are more resistant. Elaborate and conclusive experiments with factory dust distribution prove that in a moist air (40% to 50% relative) precipitation takes place very promptly. A healthful relative humidity lessens the liability of transmissions of airborne infections even though desiccative sterilization may be somewhat retarded thereby. Certain it is that a very dry air of high temperature, with the constant drafts resulting therefrom, favors rapid distribution of the dust and germs with corresponding danger of transmission of infection.

Moisture-free air is as a rule dust-charged air in that the available dust content is in circulation. Dry, dusty air is one of the irritants that excites coughing. The conclusion is evident. Moistening the air is a useful therapeutic measure.

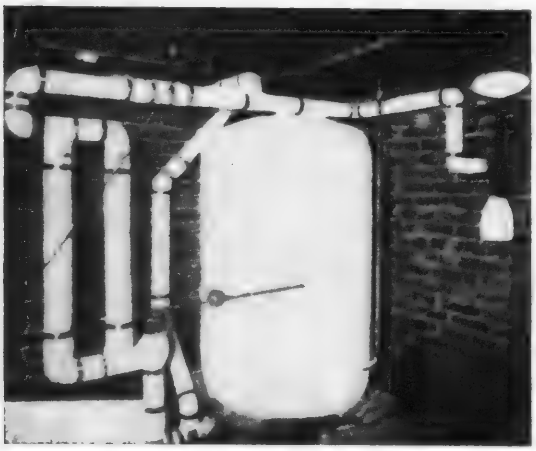
Electric Heating in Seattle

During the past two years several experiments have been carried on by the lighting department of Seattle, of which J. D. Ross is superintendent, to determine the practicability of using electricity for heating the home. For this purpose several houses have been fitted up by their owners with electric heaters, both of the direct radiation type and the type used in connection with hot water radiators. The lighting department connected these houses to its mains, made a special rate for current, and kept complete records of the temperatures maintained in the house and the amount of current used.

The first house equipped is of concrete construction with solid 8½-in. walls, and contains five rooms, having a total floor area of 418 sq. ft., a cubic capacity of 3,252 cu. ft., an outside wall area of 491 sq. ft., and a window area of 127 sq. ft. In this house were installed five electric heaters of the direct radiation type, of which three were 2 K. W. heaters and the other two had capacities of 1½ K. W. respectively. Recording meters were placed in the service to

measure the current; and the daily maximum, average and minimum temperatures, both outside and inside the house, were observed and recorded.

The total consumption for the year amounted to 10,250 K. W. hours, running from 2,430 K. W. hours in December to 20 K. W. hours in July. An average temperature of 70° F. was main-



ELECTRIC HEATER FOR SEATTLE RESIDENCE, WITH HOT WATER STORAGE TANK.

tained inside the house, and the minimum at night was kept above 58° F. The mean outside temperature was 51° F. and the minimum, 26° F. In this house no discrimination was made with regard to the time of day when the current was used.

Another method of using electric heat is to install an electric hot water heater to replace, or to be used in conjunction with the regular boilers was a hot-water heating system. In theory this method is less efficient than when direct radiating radiators are used, on account of the slight loss in the piping of the hot water system. An advantage which more than offsets this slight loss is that a hot water storage tank may be installed which will supply heat to the house for several hours after the current is turned off, and in this way the supply of current may be cut off during the hours of maximum demand on the lighting plant for current for lighting purposes.

With this scheme of electric heating, enough customers can be supplied with current for heating purposes to exhaust the full capacity of the present distribution system without any further installation whatever except for the mere service wires from the pole to the house, since the heaters will be cut off during the hours when light is used.

There are now four houses equipped with the hot water system of electric heating on the city's lines. Experience shows that one kilowatt of heater capacity will supply 20 sq. ft. of radiation and will require 20 gals. of storage tank capacity to supply heat during the lighting peak in winter.

The cost of making the installation, which is borne by the customer, will run from $10 to $25 per kilowatt capacity of the heater, depending on the size and layout of the house. This expense includes merely the wiring and installa-

ELECTRIC HEATER OF DIRECT RADIATION TYPE INSTALLED IN SEATTLE RESIDENCE.

tion of the electric heater and the cost of the heater itself. The records show that in one house of frame construction having 200 sq. ft. of radiation supplying four rooms with outside wall area of 846 sq. ft. and window area of 201 sq. ft., and cubic contents of 7,290 cu. ft., the monthly consumption of current during the winter months averages 3,000 k. w. hours with a temperature maintained in

the house at 68° to 70°, and the average monthly consumption for the entire year will be about 13,000 k. w. hours.

To sum up the results of all the heating experiments to date: Electrical heating for homes is perfectly feasible and is the most convenient and cleanest method. Despite the fact that heaters of 100% efficiency are used, the amount of current needed makes the expense at present rates several times that for heating with coal. One pound of coal contains as much heat as 3 k. w. hours in electricity, and with coal at $6 per ton and current at 2 cts. per k. w. hour, the coal costs 0.3c. as against 6c. for the current, a ratio of 20 to 1 in favor of the coal. This is partially offset by the fact that all of the heat of the current is utilized, while from 30% to 80% of the heat of the coal is wasted. Compared on a basis of cost, electricity at one-half cent per kilowatt hour is from 25% to 40% higher than coal at $6 per ton. By developing water power in large units and supplying heating during "off-peak" hours, it will probably be possible in the future to supply current at rates that will make its use for heating within the reach of the average income.

District Heating

By S. Morgan Bushnell and Fred B. Orr.

1.—Origin and Development of District Heating.

From the earliest dawn of history, mankind when dwelling in those regions situated outside the tropics, has found it necessary to obtain heat by means of fire. The origin of fire is lost in the mists of antiquity. Whether the first notion of fire was obtained from the blazing volcano, or from a forest fire, supposedly lit by the sun's rays, focussed through a piece of quartz or in some other way it is now impossible to determine.

Almost every country in the world has its myths and legends relating to the origin of fire. The Indians of North America claim that the first fire was started from the hoof of a great buffalo striking the flint-rock of the prairie, while the old Greeks had the legend of Prometheus carrying his lighted torch down to earth from the sun. The ancient savage tribes found that by briskly rubbing two sticks together they could develop the spark which would start a simple campfire.

In the castles of the middle ages great fire-places were constructed on which the logs were piled high on cold frosty evenings, while the members of the household gathered around the open fire. Later stoves were provided for a more economical consumption of coal or wood and, still later, furnaces, from which hot-air pipes were led to various portions of the building. All of these applications of heat were local from their very nature.

The more recent methods of transmitting heat by means of steam and hot-water systems have brought what is thus far the last development in the evolution of heating systems, namely, "District Heating." It is interesting to note that the development of district heating has been very closely related to the development of the central station industry for the distribution of electric light and power; in fact, many have supposed that the development of central heating was a result of the adoption of central lighting and power systems.

While it is true that certain systems of district heating, such as the Yaryan system, have been developed as a part of a system for the economical production of light and power, yet the fact remains that central station heating or district heating antedates the development of central station lighting by a number of years. It is doubtless true that in the early days of steam heating various people have heated more than one building from a single source. However, just as Thomas A. Edison is looked upon as the father of the central lighting station, so in the heating industry there is one man generally named as the pioneer inventor of central station heating, Mr. Birdsill Holly, of Lockport, New York. Mr. Holly's inventive genius found an outlet not only

in devising a practical system of central station heating, but also in the invention of the Silsby steam fire engine, the rotary pump, and last, but not least, the Holly system of direct pressure water supply, which has been used in a great many cities all over the country.

THE BEGINNING OF DISTRICT HEATING.

In 1876 Mr. Holly ran an underground line from a boiler in his residence to a barn at the rear of his property and later connected an adjoining house. In 1877, he constructed his first experimental plant at Lockport, in the State of New York, and a number of residences, stores and offices were successfully heated during the following winter.

The first installation consisted of about three miles of street mains and in 1878 another mile was added to the system. The installation was made in accordance with designs patented by Mr. Holly, his inventions applying particularly to the distribution of heating. It is a fact well known by engineers that with a steam piping system it is necessary to allow for the expansion of piping due to the effect of heat, and up to the time of the Holly system, the only method of allowing for this expansion was by means of elbows in the piping. Mr. Holly designed the first expansion joint for taking care of the expansion and contraction of piping and his method of insulating the piping underground was not so very different from the more approved methods in use today.

At the time this system of heating was designed it attracted considerable attention throughout the country and a company was organized known as the Holly Steam Combination Company, Limited. This company acquired Mr. Holly's patents on the apparatus which he designed and also the patent on the system itself. It was not long before heating plants were being established at various points all over the country. An agent of the company would visit a certain town and perhaps call a meeting of some of the representative merchants and bankers of the locality to whom the plan would be unfolded. A company would then be formed and the stock placed with the leading residents of the town. A contract would be let for the installation of pipe line and heating boilers and in a few months another district heating system would be under way.

FORMATION OF AMERICAN DISTRICT STEAM COMPANY.

In 1882 the American District Steam Company was formed and purchased the patent rights of the Holly Steam Combination Co., Ltd., also the other inventions which Mr. Holly had brought out in the previous five years. This company, which, by the way, is considerably older than the General Electric Company, has spent a great deal of time and money in experimenting and in designing central station heating systems, and has contributed in no small degree to the development of this line of business. It is true that a great many of the original plants were financially unsuccessful, just as a majority of the first lighting central stations were unsuccessful; however, in spite of all these discouragements and draw-backs, the men interested in the district heating business have gone steadily on and today the outlook for district heating is brighter than at any period of its history. It is interesting to note that while the first central station for heating was established in 1877, it was not until October 29, 1879, that Thomas A. Edison burned a carbonized piece of cotton sewing thread (in vacuum) for forty hours and demonstrated the possibility of the incandescent lamp. Two years later, after working actively on the various phases of the lighting problem, Edison was able to exhibit at the Paris exposition, a complete system of electric lighting, including the dynamo, wiring and lamps. In 1882, the Pearl Street station of the New York Edison Company was begun, this being the first central station of any importance for the production and manufacture of electricity for lighting purposes.

Turning now to the subject of district heating in New York, we find that this was started several years previous. In the winter of 1879-80, Mr. Cassius C. Peck went to New York and assisted Mr. Wallace G. Andrews, of Cleveland, Ohio, in securing a franchise for the New York Steam Company. The following year this company was consolidated with another company which did not have a franchise, the pipes were laid and the first customer was a printing establishment to

which heat was supplied in May, 1882. It was not until 1883 that steam was supplied to customers in considerable quantities. From that time on, the business grew rapidly from year to year and, as a result, the New York Steam Company has always been the largest and most important company in the country and probably in the world for the distribution and sale of steam.

FIRST DISTRICT HEATING PLANTS USED LIVE STEAM.

In connection with early history of district heating, it should be noted that the first steam heating plants used a direct steam heating system or live steam instead of exhaust steam from a power plant. In fact, probably the first electric company that became interested to any extent in central station heating was the Brush Swan Electric Light Company, of Albany, New York, which installed, in 1885, a direct steam heating plant. However, another proof of Mr. Holly's far-sighted grasp of the situation is shown in the application for a patent, made out April 18, 1881, by Mr. Holly, covering in detail various methods of exhaust heating in use today and including the combination of direct low pressure steam from boilers with exhaust steam from engines, and high pressure feeders where desired from the same system of boilers. This patent, which covers a most comprehensive and general theory of exhaust steam heating, was issued to Mr. Holly, June 27, 1882. For several years, the value of this patent seems to have been only partially appreciated and it was not until 1889 that any considerable system was installed, based on the use of exhaust steam.

BIRDSILL HOLLY, OF LOCKPORT, N. Y.
"Father" of the Central Station Heating Industry.

In December, 1889, a system was installed by the Ottumwa Railway & Light Company in the city of Ottumwa, Iowa, consisting of nearly 6,000 ft. of mains. This system was designed for the purpose of heating from house to house by

means of exhaust steam. The fact that as far back as 1878 direct steam heating systems were installed in Albany, N. Y., Springfield, Mass., and Detroit, Mich., shows that it was fully ten years after the first general knowledge of district heating that exhaust steam systems were adopted.

In Detroit the heating business has been gradually extended and was for years conducted by two companies, the Edison Illuminating Company, of Detroit, and the Murphy Power Company. In the spring of 1914, a consolidation of the two companies was effected giving the Edison Illuminating Company of Detroit a total heating business of about 1,500 customers.

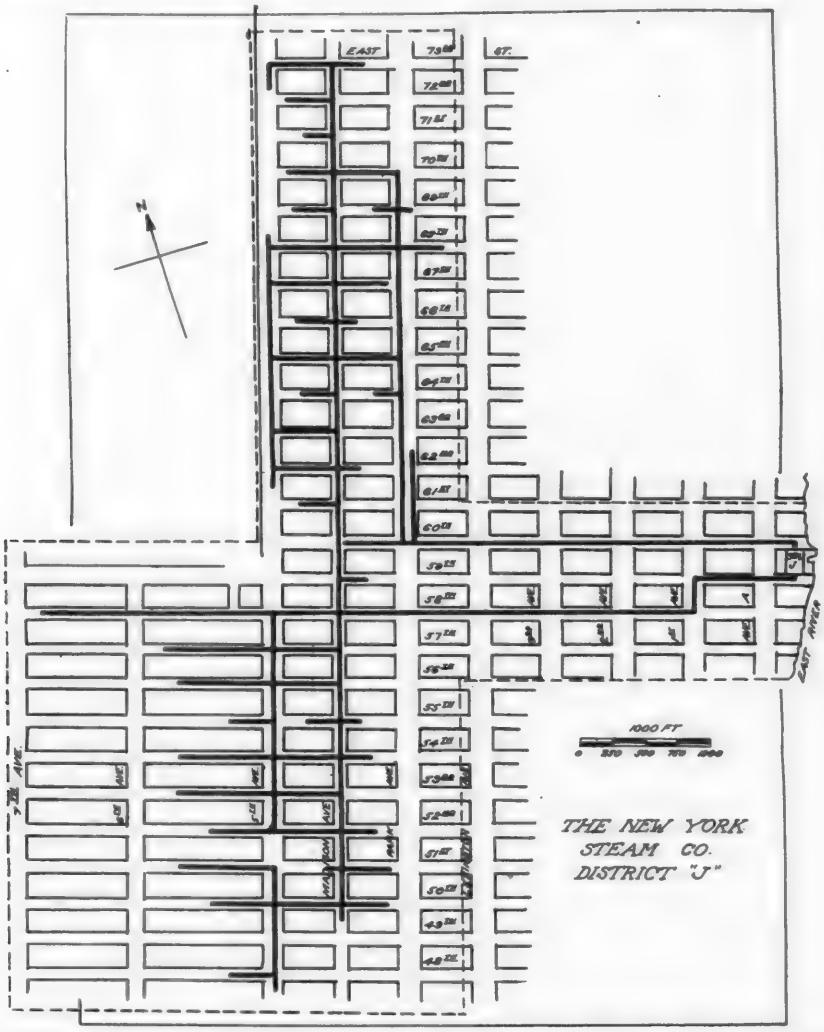
The Central Heating Company of Milwaukee is another company which has gone into the business of central heating on a very extensive scale, and with marked success. In the city of Indianapolis, there is a large amount of heating business. There were formerly three companies furnishing district heating, the Merchants' Heat and Light Company, the Indianapolis Light and Heat Company and the Home Heat and Light Company. The first two distributed heat by means of exhaust steam from the engines of their electric lighting stations, while the last used a hot-water system; the water for this system being largely heated by exhaust steam. Recently the plant of the Home Heat and Light Com-

DOWNTOWN HEATING SYSTEM OF THE NEW YORK STEAM COMPANY.

pany was bought up by the Merchants' Heat & Light Company, leaving at present two companies in the field.

SMALLER TOWNS TAKE UP DISTRICT HEATING.

District heating plants are not only in the larger cities, but also in a great many of the smaller towns throughout the country. It has been found most satisfactory and economical, for a great many colleges and various institutions having a number of buildings, to have one central heating plant to supply all the various buildings. On the Long farm near Kansas City, there are about two miles of heating mains, connecting various barns, houses for the employees, and the owner's residence. Some of the finest blooded horses are kept on this farm and by distributing heat in this way to the different barns, the danger of fire is eliminated. Ball Brothers, of Muncie, Ind., occupy seven houses connected with a system of mains about one-half mile in length, the central heating plant being located on a switch track, thus reducing the cost of fuel. However, it is unnecessary to enumerate the many cities and towns all over the country in which district heating has been adopted as a matter of convenience and economy.



UPTOWN HEATING SYSTEM OF THE NEW YORK STEAM COMPANY.

DEVELOPMENT OF COMPANIES FORMED TO OPERATE EXISTING PLANTS.

Up to the year 1900, the development of district heating was based on furnishing the service from one main central

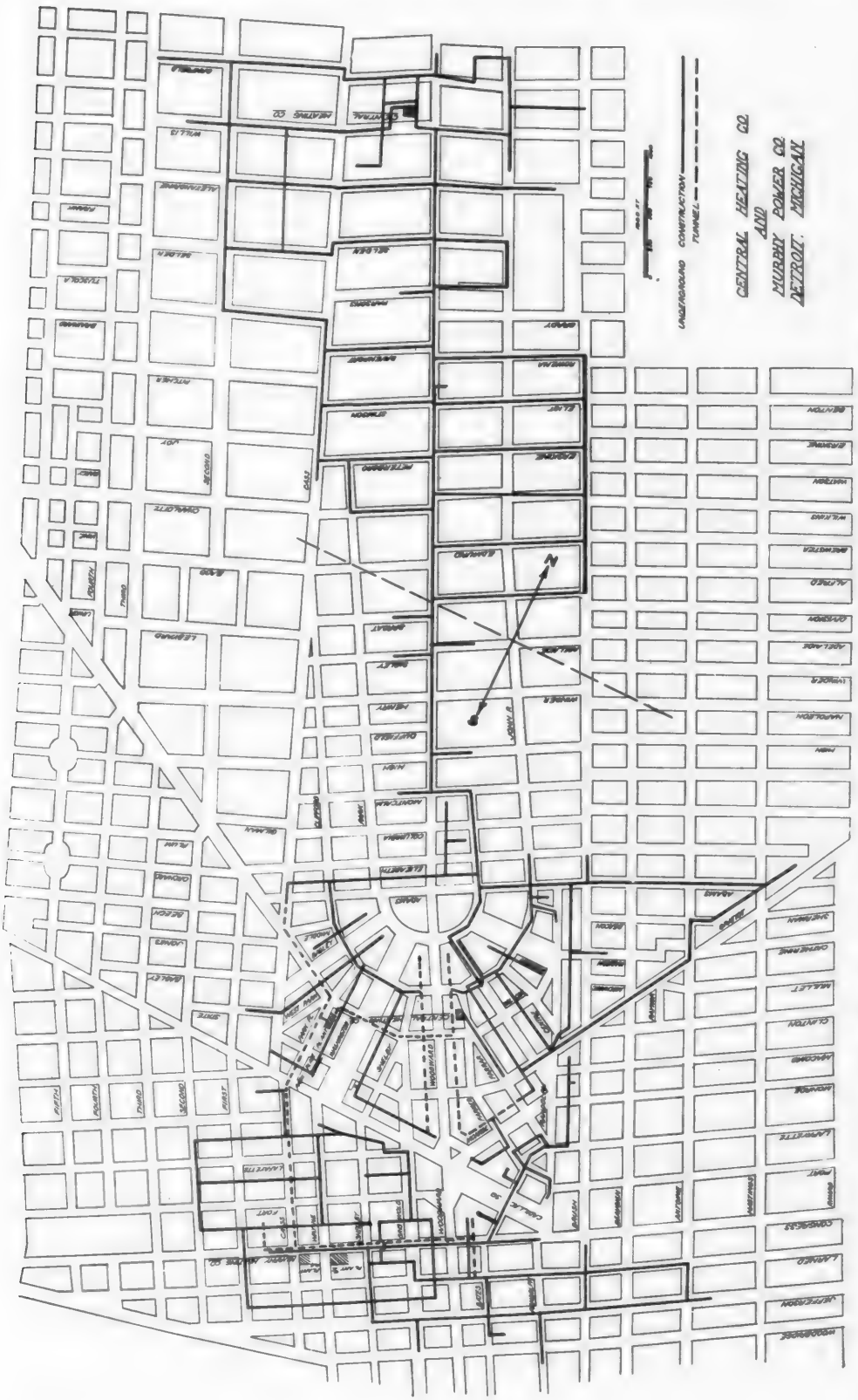
source of supply, using a system of distributing pipes running through the streets. About that time, there commenced a development of district heating along slightly different lines. Most of the large electric light and power stations began to feel a demand from their larger customers for a company that would complete the cycle of their requirements and enable building owners to contract for the three forms of energy required for the operation of a building, viz.: light heat and mechanical power. In order to supply this want, and at the same time to avoid the enormous expense connected with the installation of steam pipes in the congested districts of a large city, a company was organized in Chicago in 1900, known as the Illinois Maintenance Company.

The charter of this company was a broad one, but the main object of the company has always been to operate heating plants. The company was operating on a scheme somewhat diverse from that employed by steam heating companies up to that time. It installed no plants of its own, and, except in one or two cases, installed no boilers. Its plan was simply to contract to operate boiler plants already installed in buildings so as to furnish steam and heat for the building and for other buildings. This scheme at first sight may seem a radical departure, and it might be thought that central station heating was being lost sight of, but a careful study of the situation will prove the reverse to be true.

In the first place, the conditions to be met with in a large city are radically different from those in small towns, having a house to house business, and also having the advantage of a marked difference in economy between the small heating boiler used in houses and the large one of 300 to 500 h.p. found in the central station. Careful tests which have been made on residence boilers under test conditions show an average efficiency of 40 to 50%. It is probable that under ordinary working conditions the percentage might even be less, perhaps 35%. The large boilers used in central stations will give an efficiency of between 70 and 80%. If we would assume an average efficiency on the large boilers of 65% we would have right there a difference of nearly 50% between the coal consumption for the same amount of heat in the smaller boiler and that required with the large boiler. Furthermore, the small house heating boiler uses anthracite coal which costs fully 100% more than the soft coal used in the larger boiler installations. Accordingly, if it were not for transmission losses, a central heating plant could supply a given amount of heat with about one-fourth the coal cost of a small house heating boiler.

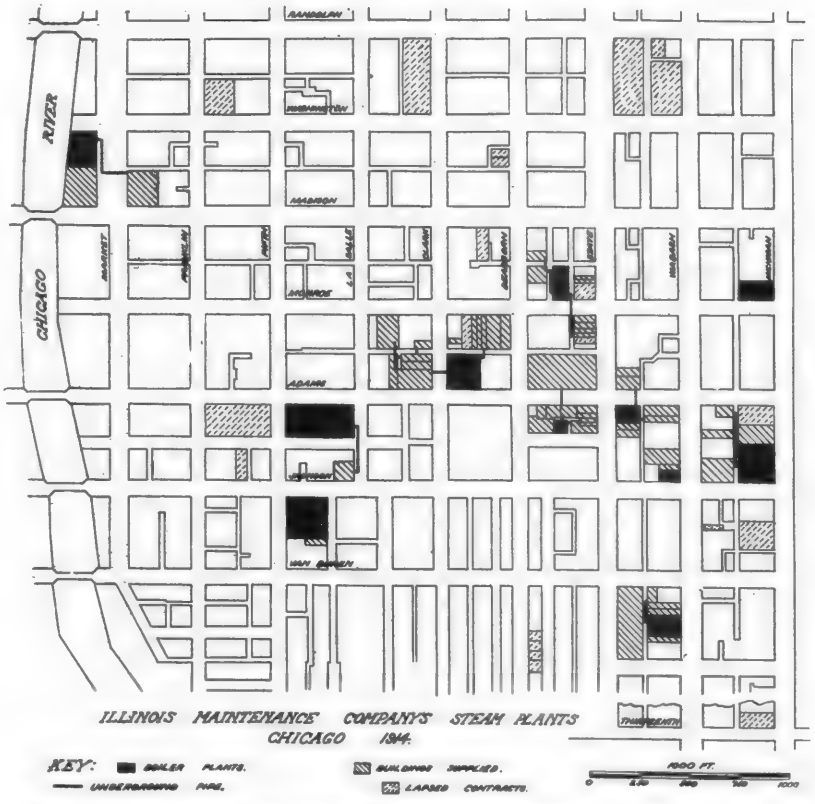
In the center of large cities like New York and Chicago, this difference disappears, as the ordinary business block will require from 100 to 500 h.p. in boiler capacity and the difference in efficiency between the 100 and 500 h.p. boiler is comparatively small. On the other hand, the difficulty of installing elaborate systems of street mains in city streets, already crowded and congested with the pipes of various other utilities, is almost insuperable. Accordingly the Chicago company adopted a consistent plan of operation which used boilers already installed in buildings and also connected by pipe lines adjacent buildings in order to gain economy by shutting down the small plants and operating only the large ones. This, to be sure, requires occasional crossing of streets, but does not require anything like the expense which would be involved in a comprehensive system.

Soon after this system was started, the Boston Edison Company inaugurated in Boston a similar system, operated under the direct management of the company. A little later the New York Service Company was organized and operates to a limited extent in the business district of New York. In Philadelphia and St. Louis a similar scheme has been worked out to a certain extent. While in all of these different cities, there are individual characteristics and slight variations from the general plan, the net result has been a rapid increase in the field of district heating. In New York City the New York Steam Company has improved its load factor by using its battery of boilers for the manufacture of ice in the summer time. In other words, the same generating plant that produces power for heat in the winter time, when heat is required, produces cold in the summer time when cooling effect is to be obtained. Other



MAP OF THE TWO SYSTEMS OF HEATING MAINS IN DETROIT, MICH.

MILWAUKEE'S DISTRICT HEATING SYSTEM.



ILLINOIS MAINTENANCE COMPANY'S STEAM PLANTS IN THE LOOP DISTRICT OF CHICAGO.

cities obtain a certain degree of economy by utilizing the exhaust steam from central lighting stations. The steam is used either for heating water used in hot-water systems or for circulating at low pressure through systems of steam piping.

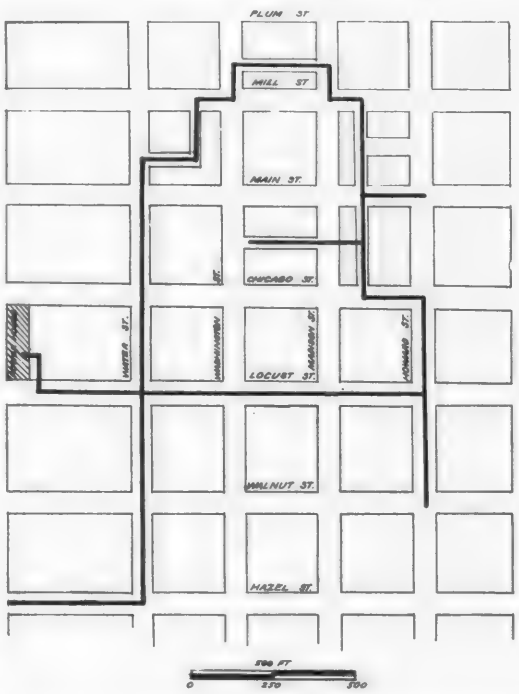
ORGANIZATION OF NATIONAL DISTRICT HEATING ASSOCIATION.

As district heating has become more and more widely used, various suggestions for economical operation have been brought forward from time to time and the engineering fraternity has grown to realize that in district heating lies a fruitful field for obtaining economies through scientific construction and management. It was in view of this situation that the need of a national association of district heating companies became more and more apparent, and this idea finally crystalized in an after meeting of the Ohio Electric Light Association, July 15, 1909. At that time a temporary organization was formed and arrangements were made for a convention which was held November 10, 1909, in the Great Southern Hotel, Columbus, O.

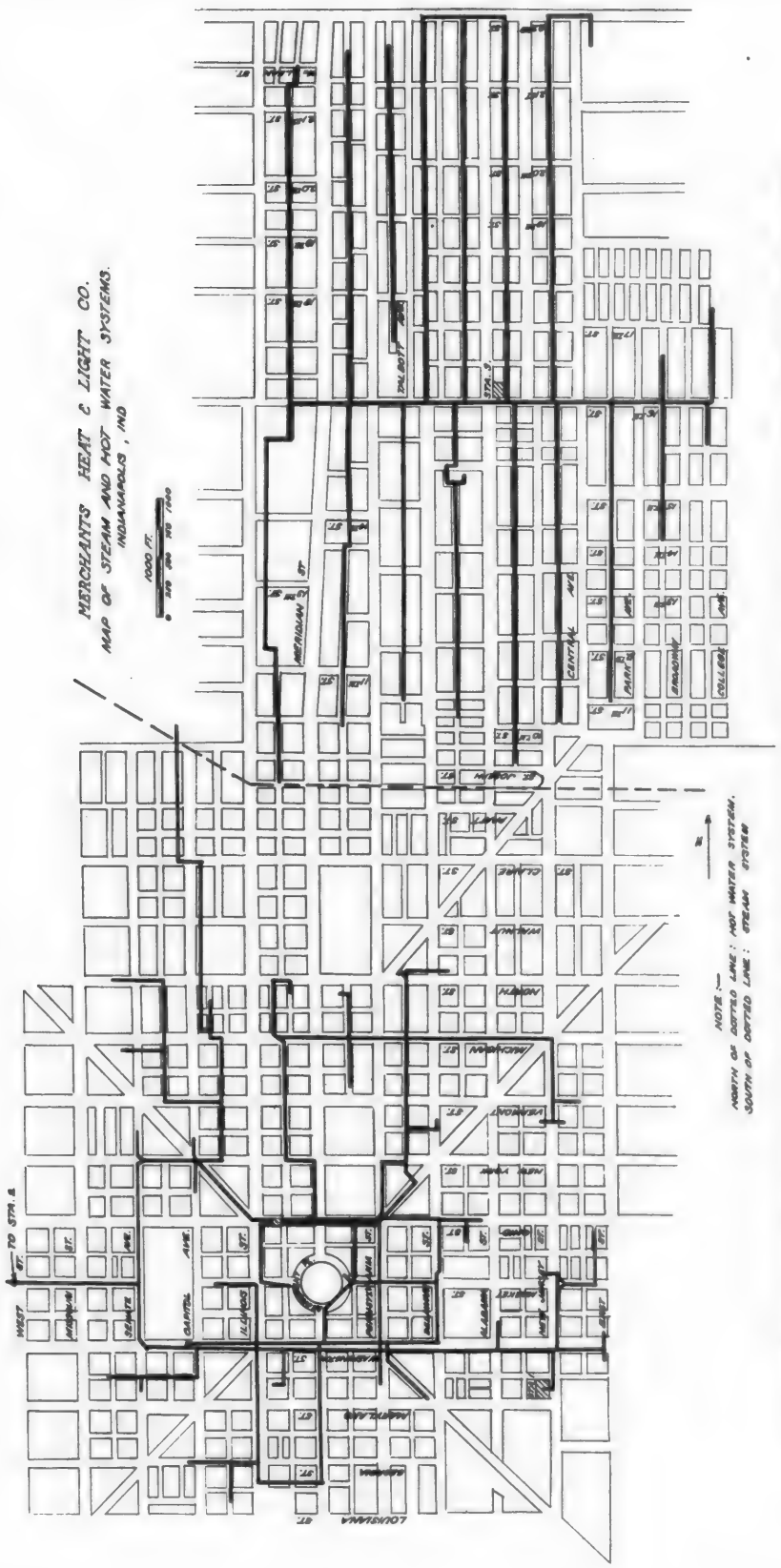
Since that time the National District Heating Association has held conventions each year during the latter part of May or the first week in June and the association has grown from a small group of about a half-dozen men in 1909, to a membership in 1914 of about 300, including most of the heating companies in the United States, several from Canada, and also members from Germany, France, England and Russia. The objects of the association have been to promote the interests of its members in all matters relating either to steam or hot-water heating, with special reference to district heating; also to establish helpful relations with kindred associations and with manufacturers of heating equipment. The association is the outgrowth of an effort to bring the business of district heating to a practical and scientific basis and provide a general distribution of knowledge concerning the important facts connected with district heating.

That the art or business of central heating has made marked progress is shown by the steady improvement in the character of the reports and papers on steam engineering subjects provided at these annual conventions. The association each year publishes bound volumes containing these reports, and their discussions, and they constitute at the present time the most complete and authentic information on the subject of district heating that has thus far been published.

While like many other associations of similar character it has passed through certain periods of discouragement, it is rapidly growing to be one of the most influential technical associations in the country, and the marked spirit of loyalty and enthusiasm that pervades the association is due not only to the pleasant acquaintances and friendships formed among the members, but also to the confident belief that the business of district heating has passed through its days of discouragement and that the future is laden with tremendous possibilties in the development and expansion of the industry. Already there are now between 300 and 400 heating companies in the United States representing an investment of many millions of dollars. This development, in the opinion of many of those most familiar with the subject, is merely the beginning of a great industry which



UNDERGROUND SYSTEM OF STEAM MAINS IN PONTIAC, ILL.



STEAM AND HOT WATER SYSTEMS OF THE MERCHANTS' HEAT & LIGHT COMPANY, INDIANAPOLIS, IND.

will have a very important influence on future civilization not only in this country but also in other countries.

TYPICAL DISTRICT HEATING SYSTEMS.

Attention is called to the maps given herewith, which show in graphic form the extent of the heating business in some of the principal towns in the country. The map showing the heating mains in the city of New York includes two systems, one the downtown system in the heart of the business district, the other the uptown system, supplying residences and moderate-sized business establishments. In September, 1914, the service supplied from these mains included 1,300 customers to whom were furnished 1,750,000,000 lbs. of steam per annum, from which the company received a yearly income of $933,000. The pipe used for these mains varies in size from 6 in. to 24 in. in diameter, and their aggregate lengths is about 73,000 ft.

The accompanying map showing the heating systems in Detroit, indicates two systems of mains totaling in length about 100,000 ft., supplying about 1,500 customers with a total of 1,500,000 sq. ft. of radiation. The accompanying map of the heating systems in Milwaukee shows a system of mains having a total length of about 60,000 ft., to which is already connected a half-million square feet of radiation. The accompanying map of the loop district of Chicago shows the extent of their sectional heating system. There are already about 800,000 sq. ft. of radiation connected, and if the additional steam for laundries, kitchens, elevator pumps, etc., is included, the steam load is equivalent to about 1,200,000 sq. ft. of radiation.

While the heating systems of the larger cities may be of special interest, yet the importance of district heating in the smaller cities and towns should not be overlooked. The accompanying map of the underground system of mains in the village of Pontiac, Ill., shows a steam heating system for heating residences and small stores comprising about 6,400 lin. ft. of underground pipe line. This system, which supplies 119 customers having about 80,000 sq. ft. of radiation connected is typical of a large number of small plants which, while individually somewhat limited in extent, form the separate links in an ever increasing chain of district heating systems scattered throughout the country.

The map showing the heating mains of the Merchants' Heat & Light Co. of Indianapolis, Ind., is interesting on account of the fact that it shows not only a steam heating system in the downtown district, fed from two boiler plants on opposite sides of the city, but also a hot water system supplied from a single plant in the residence district. The hot water system consists of about 52,000 lin. ft. of underground pipe line, and supplies about 300,000 sq. ft. of hot water radiation. The steam heating system consists of about 43,000 lin. ft. of underground pipe lines and supplies about 900,000 sq. ft. of radiation.

The foregoing are merely a few examples taken at random, and include only a fraction of the large and important steam heating systems already installed. The examples given, however, are probably sufficient to show that the business of district heating is rapidly becoming a large and important factor in municipal life, and is a business which has come to stay. In view of this fact, it may be interesting to take up in succeeding articles some of the points of practical information required in the successful operation of a steam heating company.

(To Be Continued.)

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ONE of the moot questions in the heating trade during recent years is the comparative value of live and exhaust steam as a heating medium. The discussion, as we recall it, arose in the first place through the appearance of an advertisement in which the claim was broadly made that "exhaust steam is better than live steam for heating purposes." One of the causes of this was stated to be that exhaust steam will give up its heat faster to the radiating surface than live steam from a reducing valve, as, in the latter case, the steam is in a **superheated condition.**

The statement as quoted formed the basis for an extended discussion before the heating engineers' society in which a number of speakers testified to its correctness, based upon their own experience, without being able to give a sufficient reason for it. It was claimed, for instance, that certain buildings, satisfactorily heated during the day time, when the engines were running, could not be heated with live steam at night, and in many cases the engines were kept running all night to furnish a supply of exhaust steam. This, moreover, was accomplished without increasing the coal consumption.

More recently the apparent difference has been explained on the basis of the kinetic energy of the steam; that is, that exhaust steam enters the piping in puffs and achieves a better circulation, due to the pulsations of the engine.

On the other hand, more than one keen observer has maintained with confidence that there is no difference between the relative efficiency of live and exhaust steam under otherwise the same conditions.

In view of these conflicting opinions it is a pleasure to be able to present in this issue the first careful mathematical analysis we have seen of a matter that has been shrouded in more mystery than apparently it has merited.

As a result of the analysis the statement is confidently made that "there is absolutely no difference in the physical properties of steam after passing through an engine and in leaving the boiler," and that "there is actually no difference in the use of exhaust and live steam for heating purposes, provided they are under the same conditions as to quality, pressure and temperature." Moreover, the further statement is made that either live or exhaust steam may have the advantage as to its heating quality, depending on its condition.

The writer wisely advises that engineers should cease to make use of the terms "exhaust" and "live" steam, when they are differentiating between the two, and confine themselves to the terms of "quality," "temperature" and "pressure" in either case.

THE CONSULTING ENGINEER

The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

CONDUCTED BY IRA N. EVANS, C. E.

Does it Take a Greater Amount of Heat Initially to Heat With Live Steam Than With Exhaust Steam?

In the November number of THE HEATING AND VENTILATING MAGAZINE appeared an excerpt of the discussion before the New York Chapter of the American Society of Heating and Ventilating Engineers. This excerpt is very interesting to me, particularly page 53, left-hand column. In the first paragraph is an account of the experience of Mr. Kimball with live and exhaust steam on a heating system.

We have experienced this same thing with our district steam heating system and have done considerable wondering about it without having arrived at a satisfactory solution of the problem.

Considering Mr. Kimball's case, the question arises as to whether the service given after the two engines had been put on was as good as it was with the straight live steam; that is, were the radiators as hot after the engines were started as they were before? From our experience here, there is no qustion but that the difficulties at the plant in keeping up steam are relieved by adding another engine to the line.

I believe that practically everyone concedes that exhaust steam is a better heating medium than straight live steam, as far as service, and the ability of the steam to enter air-pocketed and water-pocketed lines is concerned. We have never had a complaint registered on a change from live to exhaust steam. For a time, we thought the service was equally good, but a consideration of the engineering conditions of the problem has forced us to the conclusion that the service is not as good, but that it is not enough less satisfactory to call for complaints from customers. They do not even notice the change.

We furnish a considerable amount of live steam to our heating system, due to the fact that we are not located in a factory community. There were days last December and January, with the mercury down as low as —35° F., when we had to supply live steam for 24 hours per day. The question came up as to whether it would not be good practice to make power rates low enough to attract certain loads that we are unable to get with our present rates. The exhaust steam from this class of day load would give us enough steam for our heating system and would obviate the use of live steam with its attendant coal costs.

With exhaust steam, customers are getting as many heat units as they would get from their own boilers, assuming a similar pressure in both cases. But, as superheated steam is supplied, customers' meter readings are not in proportion to the heat units supplied, the ratio of weight of steam to heat units decreasing as the degree of superheat is increased. Thus, we figured that a low rate for power for off-peak use only was justifiable.

I have tried to work out the saving in steam effected, or rather the increase in steam which would be necessitated by the supply of exhaust steam only. The result, an increase of 2.5%, does not seem large enough, particularly in comparison with the apparent decrease in drag on the boiler when engines are started. Even then, this 2.5% is based on the assumption that 250° steam is supplied during the entire 24 hours, which is not the fact, as the enclosed temperature chart will show.

There is apparently an error in my computation.

Increase in Steam Delivered to Customers by Supplying Exhaust Steam Only.

Atmospheric pressure at 7,159 ft. altitude = 7,159 — 5,280 = 1,879 ft. = 1 1879/5280 miles.

1 mile = 12.02 lbs. pressure per square inch. 2 miles = 9.8 lbs. pressure per square inch. 12.02 — 9.8 = 2.22 lbs. difference.

(1,879 ÷ 5,280) × 2.22 = 0.79 lbs. per square inch. 12.02 — 0.79 = 11.23 lbs. per square inch = actual pressure at Laramie.

Holding maximum pressure of 3.5 lbs. gauge = 11.23 + 3.5 = 14.73 lbs. per square inch atmospheric pressure. 14.73 lbs. = 1,146 B. T. U. per pound steam.

250° F. = temperature of superheated steam. 250 — 212 = 38 superheat. 0.4805 = specific heat of superheated steam. 0.4805 × 38 = 18.259 B. T. U. to add.

1,158.3 = B. T. U. in 250° saturated steam. 1,158.3 + 1,176.6 = B. T. U. in steam at 3.5 lbs.

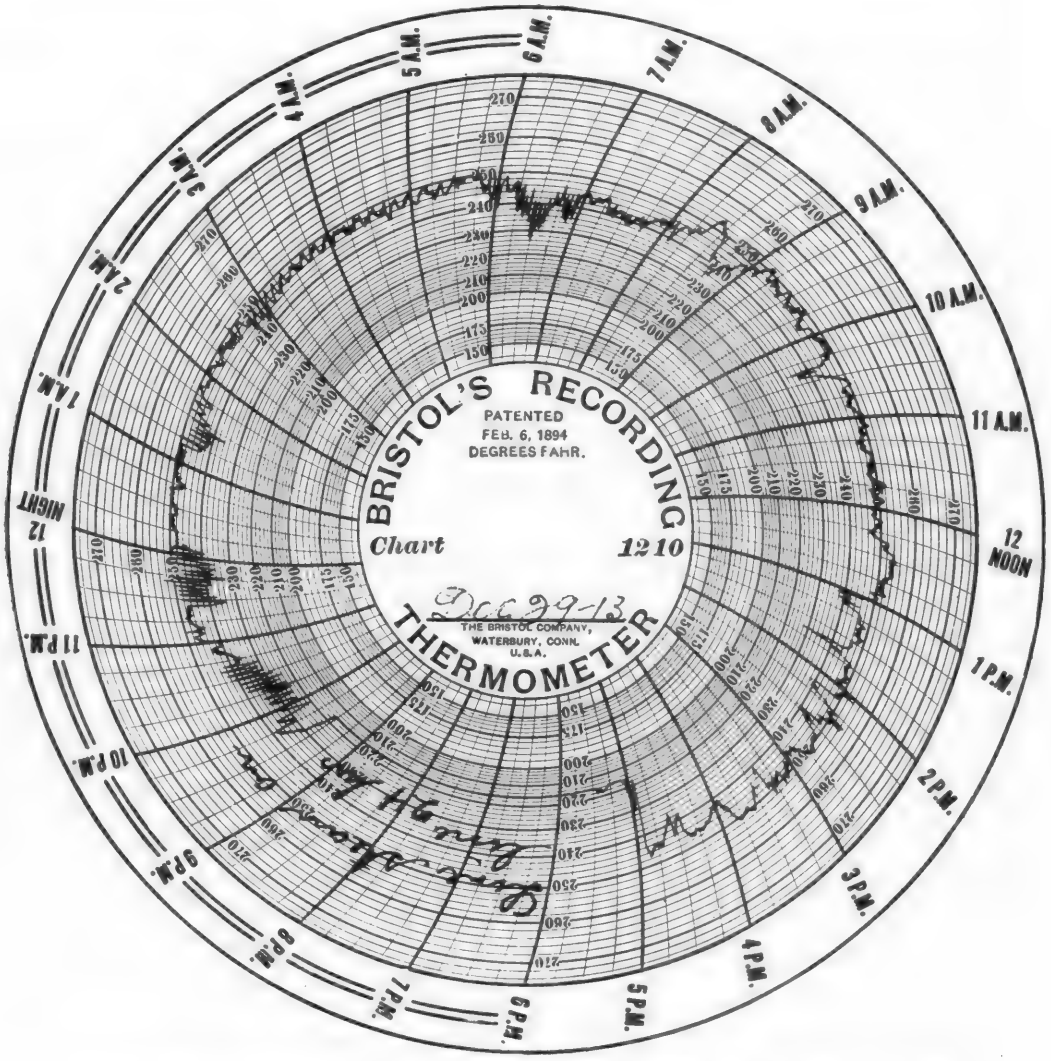
1,176.6 — 1,146.6 = 30. 30 ÷ 1,176.6 = 0.025% saving.

This matter has been put up to a number of engineers passing through here, but they have not been able to locate my error, if any exists.

As a reader of your magazine, I would be very glad to get your views on the matter. It is, I believe, of general interest to every engineer operating under conditions similar to ours. A. E. ANDERSON.

Laramie, Wyo.

ANSWER: This is a question that is often answered by operating engineers in the affirmative and the claim is made that the operation of the plant will show such to be the case by its action under either condition. Operating engineers are often apt to make such statements without analyzing the conditions and, therefore, sometimes assign an incorrect cause for some physical facts in plant operation.



STEAM TEMPERATURE CHART AT LARAMIE DISTRICT HEATING PLANT.

As little time and less money is appropriated for accurately determining the facts concerning plant operation, it is not surprising that we all more or less differentiate on the properties of exhaust and live steam as if they were two entirely and distinct products.

There is absolutely no difference in the physical properties of steam after passing through an engine and that leaving the boiler. There

is, however, a difference in its condition of pressure, temperature and quality.

Broadly speaking, exactly the same conditions of pressure, temperature and quality may be imposed on either exhaust steam or live steam. However, due to passing through an engine and doing work, the condition is generally one of lower pressure, temperature and quality than when leaving the boiler. By adding heat, however, it can be returned to its former condition of pressure and temperature.

The reason for the above inquiry and statements is occasioned by the general lack of precise expression among good engineers in describing exhaust or live steam as entirely different products.

If the conditions of pressure and quality are given as the same, live steam becomes exactly the same as exhaust steam. In some cases, exhaust steam has oil as a foreign substance from the engine. If not removed, the live steam will contain oil as well, although, perhaps, in not quite so large an amount.

A TYPICAL CASE CONSIDERED.

In answering the above question, a line of 12-in. pipe will be assumed 2,000 ft. long, covered with insulation 85% efficient, and the exact quantity and condition of the steam will be determined mathematically. An effort will also be made to show how a seeming difference in power requirements may occur, due to the heating of the feed water in either case. The condensation from the main line will be assumed as wasted to the sewer, as this is the condition generally met with in central steam plants on district heating. The conditions, it will be noted, are those given by our correspondent in connection with his inquiry.

The plant, he stated, was situated at an elevation of 7,159 ft. As the pressure, at a height of one mile is 12.02 lbs., and, at two miles, 9.8 lbs., and as there are 5,280 ft. in one mile, the proportion will be 12.02 — 9.8 lbs. = 2.22 lbs. × (7159 — 5280) ÷ 5280 = 0.79 lbs. pressure. 12.02 — 0.79 = 11.23 lbs. as the atmospheric pressure, approximately. It is stated that the gauge reads 3.5 lbs. and this added to 11.23 gives an absolute pressure of 14.73 lbs. per square inch.

This illustrates a common error in using a Bourdon spring gauge. It registers the same pressure at the sea level as on a mountain. The difference in pressure between the gauge and atmosphere at any elevation will vary, however, with the altitude. This is confirmed by the temperature of the saturated steam of 220° F. The actual pressure between that corresponding to the temperature given and the atmospheric pressure at that altitude is really 17.2 lbs. absolute — 11.2 = 6 lbs., instead of 3.5 lbs.

The initial gauge pressure for both live and exhaust steam is given as 3.5 lbs. and, for live steam, a temperature of 250° F., and, for exhaust steam, 220° F. This means a superheat of about 30° F. on the live steam and saturated steam for the exhaust, nearly. The temperatures show that the initial pressure is not quite 3.5 lbs., as it would mean a temperature of 225° F. We will, however, assume the same pressure in both cases of 17.2 lbs. absolute initial and 11.2 lbs. as the atmospheric pressure or barometer.

The flow of steam will be calculated in both cases for a total drop of 6 lbs. and the efficiency determined with 60° temperature of feed and with 210° F., which would be the case if the feed water were heated by the exhaust steam or not. The first operation will be to determine the radiation losses in the main 12-in. line 2,000 ft. long. The pipe will have 0.33 lineal feet per square foot of surface. The ground will be assumed as at 40° F. and a transmission from bare pipe of 3.5 B. T. U. per square foot per degree difference in temperature per hour.

2,000 ft. pipe ÷ 0.33 = 6,667 sq. ft. surface and 85% efficiency = 1,000 sq. ft. of bare pipe as the equivalent.

1,000 × (209 — 40) × 3.5 B. T. U. = 591,500 B. T. U. per hour saturated steam.

1,000 × (224 — 40) × 3.5 B. T. U. = 644,000 B. T. U. per hour superheated steam.

The loss per second, in each case, will be:

Saturated steam, 591,500 ÷ 3,600 = 164.3 B. T. U., and, for superheated steam, 644,000 ÷ 3,600 = 179 B. T. U.

It is first desired to know the pounds of steam per second that will be discharged in each case, using a trial drop of 6 lbs. To obtain this, we will use Meier's formula as modified in Question 35 (see September, 1914, issue). The constant and exponents have been slightly modified on account of the lower steam pressure in this case.

TABULATION OF INITIAL AND FINAL STEAM CONDITIONS.

	Initial Condition				Average			Final Condition				
	Absol. Press. Lbs.	Temp. Deg. F.	Pounds per Cu. Ft.	Total Heat Deg. F.	Pounds per Cu. Ft.	Temp. Deg. F.	Pressure Lbs.	Temp. Deg. F.	Pounds per Cu.Ft.	Total Heat Deg.F.	Latent Heat Deg.F.	Liquid Deg.F.
Saturated Steam	17.2	220	0.0432	1153.3	0.03605	209	11.2	198	0.02891	1145.2	979	166
Live Steam, Superheated	17.2	250	0.04143	1167.5	0.03517	224	11.2	198	0.02891	1145.2	979	166

P_f in pounds per square inch $= 1{,}422.92 [W^{1.97} \div (K^{0.97} \times D^{5.1})] \times$ length, or 2,000 ft.= friction.

P_v in pounds per square inch $= 3.625\ W^2 \div D^4 K =$ velocity head in pounds per square inch. The trial has already been made by the writer and is here omitted on account of lack of space.

W in pounds for the saturated steam was 5.31 lbs. per second.

W in pounds for the superheated steam was 5.24 lbs. per second.

The velocity head in each case can now be determined by substituting in the P_v formula and the proper discharge determined, with the velocity head deducted.

P_v saturated steam $= 3.625\ (531)^2 \div (12^4 \times K) = 3.625 \times (5.31)^2 \div (20{,}736 \times 0.03605) = 0.1365$ lbs. per square inch.

P_v for superheated steam $= 3.625\ (5.24)^2 \div (20{,}736 \times 0.03517) = 0.13703$ lbs. per square inch.

The net discharge for the saturated steam in pounds per second will be: $W^{1.97} = [0.03605^{0.97} \times D^{5.1} \times (6 - 0.1365)] \div (1{,}422.92 \times 2)$.

Applying logarithms, $W^{1.97} = 5.50382412 - 1.39980159 - 3.1531805 + 0.4671269$.

$W^{1.97} = 1.41786983$; $W = 1.41796893 \div 1.97 = 0.7197812 = 5.246$ lbs. per second for saturated steam.

The net discharge for the superheated steam will be:

$W^{1.97} = [(0.03517)^{0.97} \times 12^{5.1} \times (6 - 0.137)] \div (1{,}422.92 \times 2)$.

$W^{1.97} = 5.50382412 - 1.41021277 - 3.15318050 + 0.4670809$.

$W = 1.40752075 \div 1.97 = 0.7144268 = 5.1812$ lbs. per second for superheated steam.

The loss in pounds per second in condensation for the mains, due to radiation losses, will be, for saturated steam:

$164.3 \div (5.25 \times 979$ B. T. U.$) = 0.32$ lbs. per second per pound delivered.

0.032×5.246 lbs $= 0.168$ lbs. steam condensed due to radiation from main. As there is one-half the condensation before the center of the line is reached, only one-half is deducted from the flow. The net discharge for use at the end of the line will be 5.246 lbs. $- [(0.032 \div 2) \times 5.246] = 5.162$ lbs. per second as the net discharge for saturated steam at 11.2 lbs. absolute for use.

For the superheated steam the loss per second will be 179 B. T. U. and as the steam is superheated the loss in condensation will be reduced. $179 \div 5.2 = 34.5$ B. T. U. per pound per second.

$1{,}167.5 - 34.5 = 1{,}133$ B. T. U. per pound, which is below the total heat at the final pressure and temperature, which is 1,145.2 B. T. U.

$1{,}145.2 - 1{,}133 = 12.2$ B. T. U. condensed. Taking the condensation as one-half as before, $6.1 \div 979 = 0.0062$ lbs. per second per pound of steam delivered.

$0.0124 \times 5.2 = 0.06448$ lbs. steam condensed to water per second.

$5.1812 - (0.06448 \div 2) = 5.149$ lbs. net delivered at the end of the main for heating at 11.2 lbs. absolute for superheated steam.

The initial weight will be the net weight at the end of the line plus that due to radiation and condensation. For the saturated steam the initial quantity will be $5.162 + 0.1680 = 5.33$ lbs. per second. For the superheated steam the weight delivered will be initially $5.149 + 0.0645 = 5.2135$ lbs. per second.

The total condensation leaving the mains to the sewer in each case will be, for the saturated steam, $0.1682 \times 3{,}600 = 605.52$ lbs. water per hour, and, for the superheated steam, $0.645 \times 3{,}600 = 232.13$ lbs. per hour. $605 \div 232 = 260.8\%$, or the saturated steam involves 160.8% greater condensation of water than the superheated steam.

The net heat in B. T. U. per second delivered, with the saturated steam, will be 979.2 B. T. U. (latent heat) at 11.2 lbs. absolute. 5.162×979.2 B. T. U. $= 5{,}054.63$ B. T. U. per second, saturated steam. 5.149×979.2 B. T. U. $= 5{,}041.9$ B. T. U. per second superheated steam. This shows a very slight advantage of about ½ or 1% in favor of saturated steam.

The heat supplied in each case to obtain the delivery will be as follows, if the feed water temperature was 210° F., with 178 B. T. U. in the liquid:

For the saturated steam, $5.33 \times (1{,}153.3 - 178) = 5{,}198.35$ B. T. U. per second. For the superheated steam, $5.2135 \times (1{,}167.5 - 178) = 5{,}158.76$ B. T. U. per second.

With 60° feed and 28 B. T. U. in the liquid, the heat supplied will be, for saturated steam, $5.33 \times (1{,}153.3 - 28) = 5{,}997.84$ B. T. U. per second, and, for superheated steam, $5.2135 \times (1{,}167.5 - 28) = 5{,}940.8$ B. T. U. per second.

The relative efficiency of the superheated steam over saturated steam under the two feed conditions as named, which would represent fairly the use of exhaust steam against the use of live steam, will be as follows:

Saturated steam, feed 210° F. $5{,}054.63 \div 5{,}198.4 = 97.23\%$.

Superheated steam, feed 210° F. $5{,}041.9 \div 5{,}158.76 = 97.73\%$.

Saturated steam, feed 60° F. $5{,}054.63 \div 5{,}997.84 = 84.27\%$.

Superheated steam, feed 60° F. $5{,}041.9 \div 5{,}940.8 = 84.87\%$.

NO DIFFERENCE UNDER LIKE CONDITIONS.

This shows that there is little or no difference in the use of exhaust or live steam under like conditions, but there is an advantage in using superheated steam in total efficiency, whether exhaust or live steam, due to the less

amount of condensation lost from the mains. If the condensation were returned to the boiler, instead of being wasted to the sewer, the feed temperature would become, in this case, 198° F., instead of 210° F.

There is, however, an apparent difference of about 13%, due to the heating of the feed water in the power house and this is represented roughly by the initial feed temperature condition. There is, however, no actual difference except that due to the addition of make up water at the feed temperature, obtained from condensed exhaust steam used for feed purposes.

There is also the actual saving in loss of water by the use of superheat which amounts to 373 lbs. per hour, or a saving in water by the use of superheat of 166% over the use of saturated steam.

EFFECT WHERE ALLOWANCE IS MADE FOR RECOVERY OF WATER AND HEAT.

If the water and heat recovered from the use of condensed exhaust steam in heating feed water from 60° to 210° is allowed for, it will be as follows:

The latent heat of 17.2 lbs. absolute is 965.2 B. T. U. The difference in B. T. U. required for 210° feed and 60° feed is 178 — 28 = 150 B. T. U. 150 ÷ 965.2 = 0.1554 lbs. steam condensed per pound per second. For the saturated steam, this will be 0.1554 × 5.33 = 0.83 lbs. water saved from condensed exhaust steam. There is lost in the mains on saturated steam 0.1672 lbs. per second. 0.83 — 0.1682 = 0.6618 × 3,600 = 2,382 lbs. water per hour. The reduction in heat for feed water required would be 0.83 × 150 B. T. U. = 124.5 B. T. U. per second.

With feed at 60° and exhaust for heating it, the initial requirements would be 5,997.84 — 124.5 = 5,873.3 B. T. U. For superheated steam the reduction in water recovered would be 0.1554 × 5.2135 = 0.8102 lbs. per second. 0.81024—0.0645 = 0.75 × 3,600 = 2,700 lbs. water per hour recovered, as against 2,382 lbs. for saturated steam. The heat reclaimed in the condensation used will be 0.81204 × 150 B. T. U. = 121.8 B. T. U. per second. This would mean a reduction in the heat requirements of superheated steam of 121.8 B. T. U. or 5,940.8 — 121.8 = 5,819 B. T. U. as the initial heat required for superheated steam.

Therefore, the efficiency for the feed temperature of 60° F. would change by use of exhaust steam for heating the feed from 84.27% and 84.87% for saturated and superheated steam to:

For saturated steam, 5,054.63 ÷ 5,873.3 = 86.05%, as against 84.27%.

For superheated steam, 5,041.9 ÷ 5,819 = 86.63%, as against 84.87%.

As there is always more or less exhaust steam from auxiliaries in a power plant, whether the plant is under load or not, the actual apparent difference would be an efficiency as shown by the feed at 210° and saturated steam of 97.23% to the other extreme of superheated steam and a feed of 60°, or 84.87%, depending on the available supply of exhaust steam for feed purposes, or an apparent difference of 12.5%

The actual difference in efficiency, if the feed were 60° initial in both cases and the use of exhaust steam for feed water accounted for, is 84.87% for live steam and superheat, and 86.06% for saturated steam, or a difference of 1.19% in favor of the exhaust steam saturated for heating. This may vary all the way from 84.87% to 97.23%, dependent on the feed water arrangements and exhaust available for feed purposes.

As a matter of fact, there is actually no difference in the use of exhaust or live steam for heating purposes, provided they are under the same conditions as to quality, pressure and temperature. In most plants, conditions may obtain where the exhaust steam and live steam may be under like conditions or vice versa.

For the reasons given above, and on account of the confusion arising from the use of inexact engineering terms and statements, the heating by exhaust or live steam should cease as a differentiation, and the quality, temperature and pressure should be considered. Then it may be either exhaust or live steam that has the advantage, depending on its condition.

NOTE—*Through a typographical error, the true formula for draft intensity, published in the December issue, was incorrectly given. It should be as follows:* $D = [(7.6 \div T_a) - (7.9 \div T_e)]\ h$ *in which* T_a *and* T_e *are the absolute temperature or the thermometric temperature* + 460° F. d *is the draft in inches of water and* h *the effective height of the chimney.*

Life of Wood Pipe for Conveying Water.

That the life of wood pipe should be at least 20 years, if the pipes are fully exposed and supported free from all contact with the soil, if the material is either fir or redwood, and if the pipe has been properly maintained, is the conclusion of a specialist of the United States Department of Agriculture in a professional paper on "Wood Pipe for Conveying Water for Irrigation" (Bulletin No. 155). The new bulletin which consists of 37 pages, contains a number of figures and tables of practical use to engineers. Continuous stave pipe and machine-banded pipe are described in great detail and many specific instances are given to show how long wood pipe may be expected to last under special conditions.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Programme for Annual Meeting.

Plans completed for the professional and other sessions of the annual meeting of The American Society of Heating and Ventilating Engineers provide for a meeting that will rank well up with those of previous years, if not exceeding them in variety and interest.

As stated in last month's issue, the meeting will extend from January 20 to January 22, or from Wednesday to Friday, inclusive. To carry out the provisions of the constitution a session will be called for Tuesday, January 21, which will immediately be adjourned to the following day.

Papers received for presentation at the annual meeting include the following:

The Centrifugal Fan, by the late Frank L. Busey.

The Recirculation of Air in a Schoolroom in Minneapolis, by Frederic Bass.

A Study of Heating and Ventilating Conditions in a Large Office Building, by C. E. A. Winslow.

Some Data on Warm Air Heating, by Roy E. Lynd.

Cinder Removal from Flue Gases of Power Plants, by C. W. Grady.

The Problem of City Dust, by Reginald Pelham Bolton.

The Burning of Crude Oil as Fuel on the Pacific Coast, by H. S. Halsey.

Flow of Steam in Pipes by J. S. Otis.

The Heating Value of Exhaust Steam by D. M. Myers.

Engine Condensation, when the Exhaust is Used for Heating, by Perry West.

Studies in Air Cleanliness, by M. C. and G. C. Whipple.

Gas Appliances for Heating, by George S. Barrows.

The entertainment program provides for the usual outings for the ladies. Trips of inspection for the men between sessions have also been arranged, one of which will be made to the plant of the Vitagraph Company, manufacturer of moving picture films.

The annual dinner of the society will be held at the McAlpin Hotel, Thursday evening, January 21st, while on Friday evening the members and guests will form a theatre party.

New Members.

Following are the names of those recently elected to membership in The American Society of Heating and Ventilating Engineers:

MEMBERS

Charles A. Blaney, Kalamazoo, Mich.

Thomas P. Brennan, 502 West 141st Street, New York.

Charles H. Eastman, 235 Congress Street, Boston, Mass.

Laurence Franklin, 62 High Street, Boston, Mass.

Edgar W. Mandeville, 126 Hawthorne Street, Brooklyn, N. Y.

Albert C. Townsend, 22 West 84th Street, New York City.

John H. Van Zandt, Fort Worth, Texas.

Jas. B. Wigman, Bloomington, Ill.

Fred W. Williamson, 413 Putnam Avenue, Brooklyn, N. Y.

ASSOCIATE MEMBERS.

Theodore W. Jennings 304 Pleasant Street, Winthrop, Mass.

William G. LeCompte, 80 White Street, New York.

Raymond H. Lindman, 57 Board of Trade, Chicago, Ill.

C. W. Sisson, 136 Federal Street, Boston, Mass.

Charles S. Wood, P. O. Box 455, Newark, N. J.

John A. Wachter, 2422 East Baltimore Street, Baltimore, Md.

JUNIOR.

Frank X. Loeffler, 121 West 113th Place, Chicago, Ill.

Lecture Before New York Chapter on "Heating the Skyscraper and Its Problems."

Details of the piping problems in a modern skyscraper were presented by William H. Driscoll, chief engineer for the Thompson-Starrett Co., New York, at the December meeting of the New York Chapter. Mr. Driscoll's address was illustrated by lantern slides, the views including exterior and interior views of such notable buildings as the Union Central Trust Building in Cincinnati and the Municipal Building, the Woolworth Building and the mammoth new Equitable Life Building in New York.

Mr. Driscoll said that one of the greatest problems in the heating of a skyscraper is the heat losses, especially the leakage of air, not only in the upper stories, but also on the lower floors, due to the updraft. It is also true of skyscrapers that they are usually designed on comparatively short notice, necessitating quick and accurate work in the making of the drawings.

The usual method of supplying heat in tall buildings, he said, is to have an up-feed supply to take care of the first floor only. The balance of the system is divided into sections at different levels. In the Wool-

worth Building there are three such sections.

Mr. Driscoll devoted most of his talk to the equipment in the new Equitable Building. He said some idea of the size of this structure could be gained from the fact that while the Union Central Building in Cincinnati was recently the largest office building in the world outside of New York, the Equitable Building has no less than five times as much floor space as the Cincinnati building.

It contains a total of 155,000 sq. ft. of direct radiation, divided into 5,000 radiators. The exhaust riser, which he described in detail on account of the care required in its design, is 34 in. in diameter and weighs 85,000 lbs. Provision was made for an expansion of 8 in., and this was found to be very close to that which occurred when the steam was turned on. It was necessary to use great care in the location of the flanges so that they would not come in contact with the girders.

There are 132 return raisers on the job, containing 80,000 ft. of pipe. Other statistics include 6,000 fittings and 48,000 ft. of piping used in the radiator connections.

Mr. Driscoll called attention to the need of economizing every cubic inch of space possible in the installation of the equipment on account of the rental value of the space and he referred to the difference between the practice in New York and in Chicago. In New York the radiator branches and the risers are concealed, while in Chicago they are usually run exposed. He expressed his belief that it was probably better practice to run them exposed, but that the space values in the New York buildings were so large as to make the owner willing to take a chance as to the tearing up of the floors or walls for necessary repairs.

This matter of economy of space applies also to the depth of the floor fills, and every effort is made to run the horizontal pipes as close as possible to the beams. Where allowances have to be made for riser expansion, it is necessary to figure this down to a fine point.

In the Woolworth Building, which is equipped with a three-pipe system, he said the third pipe was installed partly to take care of the practically level branch connections to the radiators. While this added greatly to the cost of piping, it also reduced to a large extent the cost of the floor fill.

The speaker called attention to the use of single-column radiators located in many cases a little farther away from the window than usual. He said the advantage of this arrangement was that if it were found desirable to install larger units, there would be room for double-column radiators of the same length, whereas if it had been necessary to install longer one-column radiators, it would be necessary to tear up the floor to rearrange the piping.

Another point emphasized by the speaker was the importance of having the car tracks in the boiler room exactly 8 ft. from the furnace fronts. This, he said, enabled the fireman to shovel the coal and ashes without taking a step each time, which was a very important point to remember.

A number of views presented showed the intricate mazes of piping, which, the speaker stated, sometimes ran so close that there would be practically no space between the pipes. Moreover, this had to be figured out before the construction began.

In addition to the main business of the evening, the chapter voted to appoint a special committee to co-operate with Superintendent of Buildings Miller, of the New York City Building Department, in the preparation of proper heating and ventilating requirements for the new building code, which is in preparation. The appointments will be made by President Timmis and announced later.

The plans were given of the chapter's entertainment committee for the annual meeting of the Heating Engineers' Society. These plans include a dinner at the Hotel McAlpin on the evening of Thursday, January 21, and a theatre party for all on Friday evening, the 22d. This, it will be noted, is a change from previous years, when the dinner was held on a Wednesday evening.

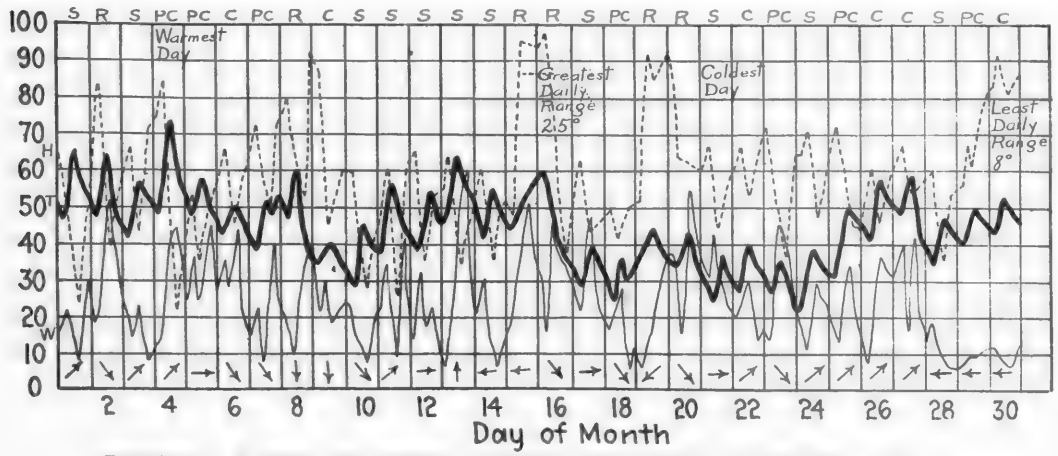
Illinois Chapter.

Dr. E. Vernon Hill, of the Ventilating Inspection Bureau of the Chicago Health Department, was the principal speaker at the December meeting of the Illinois Chapter, his topic being "Air Conditioning for Residences." Following Dr. Hill, A. Bement described a device for humidifying residences, which aroused much interest. Other speakers were Frank Douglas, D. I. Cook and Prof. J. W. Shepard. About 25 members were present.

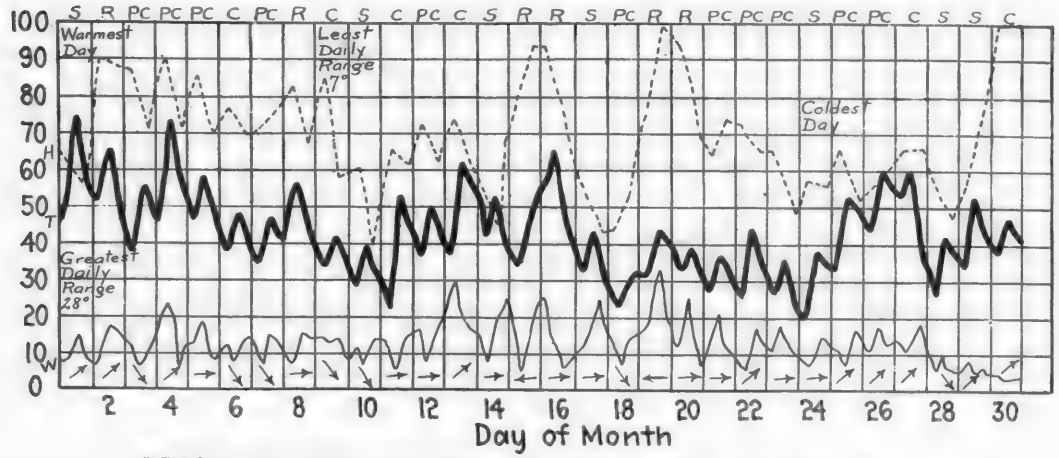
The January meeting will be devoted to a discussion of "Restaurant Ventilation" and "Methods of Correcting Defective Jobs."

The Weather for November, 1914.

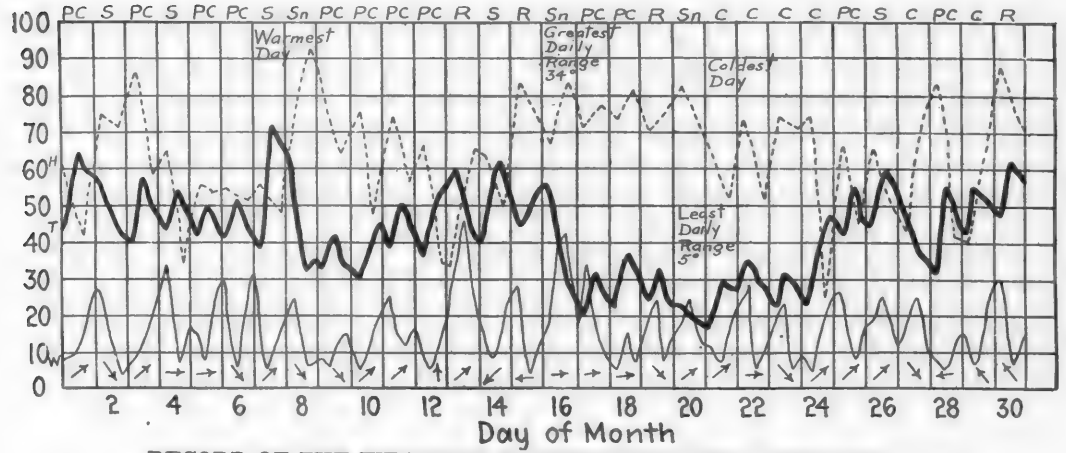
	New York	Boston	Pittsburg	Chicago	St. Louis
Highest temperature, degrees F.	73	74	72	71	80
Date of highest temperature	4	1	7	1	6
Lowest temperature, degrees F.	22	20	18	12	13
Date of lowest temperature	23	24	21	20	19
Greatest daily range, degrees F.	25	28	34	28	30
Date of greatest daily range	16	1	16	15	6
Least daily range, degrees F.	8	7	5	5	8
Date of least daily range	30	9	20	16	13
Mean temp. for month, deg. F.	44	43	43	44.4	50.3
Normal mean temperature for month, deg. F.	44	41.2	42.9	39.2	43.4
Total rainfall, inches	2.08	2.72	1.35	0.33	1.53
Total snowfall, inches	—	Trace	4.0	Trace	—
Normal precipitation, this month, in.	3.44	4.1	2.55	2.5	2.88
Total wind movement, miles	15,325	8,494	9,378	10,006	9,499
Average hourly wind velocity, miles	21.3	11.8	13.5	13.9	13.2
Prevailing direction of wind	S. W.	W.	S. W.	W.	S. W.
Number of clear days	11	7	5	17	21
Number of partly cloudy days	9	11	13	3	4
Number of cloudy days	10	12	12	10	5
Number of days on which rain fell	8	6	7	6	5
Number of days on which snow fell	—	—	3	—	—
Snow on ground at end of month, in.	—	—	—	—	—



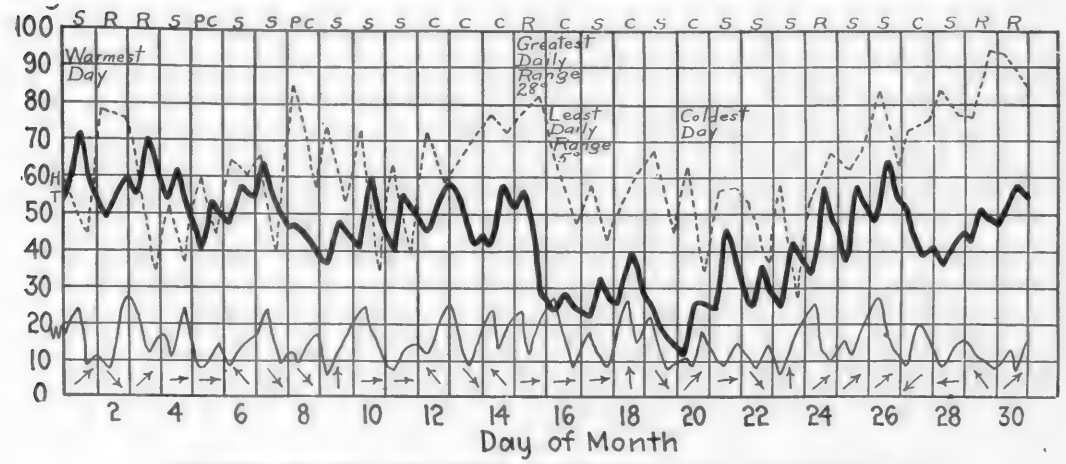
RECORD OF THE WEATHER IN NEW YORK FOR NOVEMBER, 1914.
(Hourly Observations of the Relative Humidity Are Recorded on This Chart).



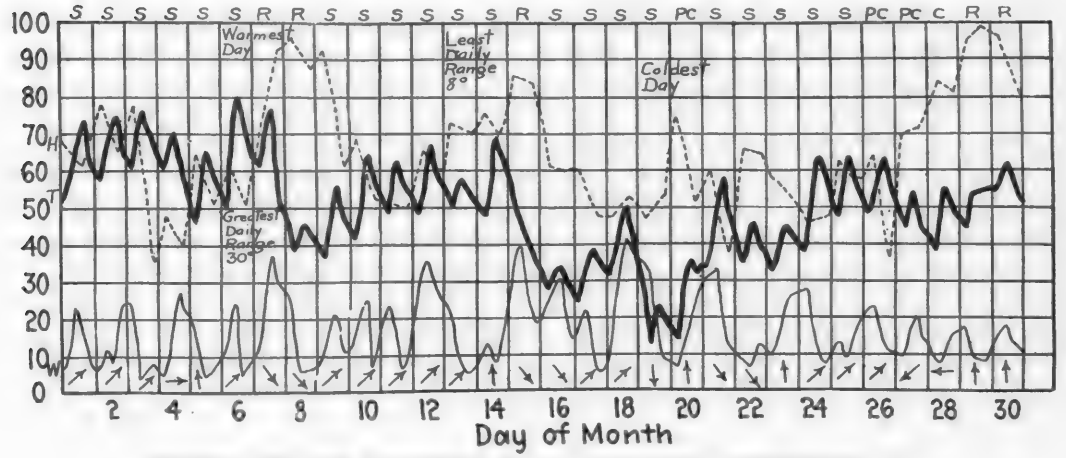
RECORD OF THE WEATHER IN BOSTON FOR NOVEMBER, 1914.



RECORD OF THE WEATHER IN PITTSBURGH FOR NOVEMBER, 1914.



RECORD OF THE WEATHER IN CHICAGO FOR NOVEMBER, 1914.



RECORD OF THE WEATHER IN ST. LOUIS FOR NOVEMBER, 1914.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.

Heavy lines indicate temperature in degrees F.

Light lines indicate wind in miles per hour.

Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.

S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.

Arrows fly with prevailing direction of wind.

Horizontal Air Currents Advocated for Room Ventilation.

Referring to the theory now widely held that heat stagnation is responsible for many and perhaps most of the effects which we have been accustomed to refer to as defective ventilation, Arthur H. Barker, in his recent address before the British Heating Engineers' Society, expressed himself as being equally sure that this was not the whole truth, and that there is something in ventilation over and above the loss of heat and the suppression of smell.

He is quite convinced, he said, that all air of the same temperature, pressure, humidity and velocity has not the same effect on the human organism. Air loses that quality, whatever it is, which with present knowledge we can only describe as crispness when it passes over accumulated dirt, or into close contact with metal, or through a long underground pipe channel, or when it is heated by a hot surface, for this quality of crispness is not merely a matter of temperature, humidity and velocity. Still, we might provisionally accept the theory that the temperature, humidity and velocity of air in a room are points of very great importance in the ventilation, and that one of the chief, but not the only, reason for this importance is that they determine jointly the rate of heat loss from the body.

If we accept the view that the object of controlling the temperature, humidity and velocity of air is solely to regulate the rate of heat loss from the body, it is evident that the only instrument we require to measure the effect of ventilation is one which will enable us to measure the joint effect of these three factors as far as they effect the abstraction of heat from the body. On this assumption the possession of such an instrument at once raises the science of ventilation to a higher plane, for it enables us to measure the success of a scheme of ventilation.

Mr. Barker proceeded to describe two instruments devised by Dr. Leonard Hill with this object, and said their invention was an event of the utmost importance. If the control of heat loss is the sole object of ventilation (a theory he himself does not accept) then a modified form of these instruments is all that is required to show whether a room is well ventilated or not.

Mr. Barker's own view is that we need at least in addition to determine the velocity of movement at all parts of the room; also what he calls the radiant temperature and the absolute temperature of the air itself; the amount of dust in the air, and, perhaps, the amount of organic products in the air when the room is crowded.

Dealing with different ways of introducing air into a room, Mr. Barker said that all physiologists are agreed that the rate of loss of heat from the face and hands ought to be far greater than that from the feet, which would indicate that downward ventilation is superior from this point of view. The view he himself holds strongly is that a horizontal velocity must also be produced before the indoor ventilation can be regarded as satisfactorily accomplished, and that it is necessary either to stimulate the nerves of the skin or some other physiological purpose quite independently of the loss of heat from the body.

We have to find by experiment what is the maximum velocity people can endure, and by subjecting a large number of people of different physique to the same experiment and taking careful note in each case, we might conceivably arrive at a certain medium velocity of air of suitable temperature and humidity which would not be perceptible to anyone as an uncomfortable draft, while in all cases producing a feeling not of cold but of refreshment. This is the velocity of air which the ventilating engineer should aim to produce.

Mr. Barker's own view of the method of securing horizontal velocity is from the back to the front of a room. Visible rotating fans are out of the question, in his opinion, and we would have to introduce the air through gratings in the wall.

To summarize the observations which appeared to him to be necessary in order that we might get a complete idea of the state of ventilation of any given room, he stated that we must have wet and dry bulb thermometer readings; that we must know the absolute temperature of the air and the mean radiant temperature; and should have readings indicating the velocity of the air in all parts of a room when the room is full. We should also have the analysis of the air and particularly knowledge as to what amount of organic products exist in the room. Further we should take the electrical readings and determine the degree of ionization of the air of the room.

CORRESPONDENCE

Lift Fittings and Lift Pockets in Vacuum Steam Heating Work.

EDITOR HEATING AND VENTILATING MAGAZINE:

On pages 25 and 26 of your September, 1914, issue, special lift fittings and lift pockets for vacuum return lines are shown. Will you kindly explain how these devices work and what trouble they avoid? Will you also explain under what conditions of temperature, vacuum, etc., it is necessary or advisable to install them? Is there any choice between the special lift fittings and the lift pocket?

EDWARD L. WILDER.

Rochester, N. Y., December, 1914.

REPLY BY MR. T. W. REYNOLDS.

Lift pockets are necessary in a vacuum return system when it is desired to lift the water of condensation from a lower to a higher level. It is obvious that without the use of such fittings, water would not flow through the return which is at a higher level until the lower return had been flooded up to the highest point of its inside diameter. The water would then be lifted and carried back to the vacuum pump in large quantities, until the long horizontal return main had been completely emptied. This would produce an unsteady load on the vacuum pump. Furthermore the radiating surfaces under such conditions will not heat satisfactorily, for the vacuum will only extend to these points at certain times; as, for instance, with the emptying of the return. Also, the return, while filling, automatically decreases its own cross section through which the vacuum exerts itself.

A lift pocket merely insures the lifting of the returns because of the always present well of water as is required in any mechanical device when used for a similar purpose. The water is lifted from this well as fast as it is received; the top of the well being level with the bottom of the return main, because of the vertical lift pipe extending to that point. Furthermore, the lifting device insures a steady operation of the pump and system. Lift pockets are not an experiment, but have been tried out in practice in many installations; and have been used with success, even on 16-ft. lifts. Generally speaking, the necessity for a high lift is rather a remote contingency; which may usually be avoided in a system properly designed.

To make a lifting device by using pipe fittings is not advisable; for extreme care must be used in inserting the lift pipe; there being no way of insuring the position of this pipe, with respect to the lower horizontal return. The probabilities are that the vertical pipe will be extended too far into the tee by the steamfitter, and that it will, therefore, refuse to operate properly, if at all.

The following sketches are submitted in order to show established methods of lifting returns in connection with a lift fitting as manufactured by Warren Webster & Co., Camden, N. J. The sketches are more in detail than those shown in the issue referred to by the correspondent. Full information as to the operation of these devices in connection with the arrangements shown, both practically and theoretically, may be obtained from the manufacturers, who have constructed a device consisting of a glass tube which demonstrates clearly the practicability of the arrangement as shown in Fig. 1. The use of this latter method is only necessary in extreme cases,

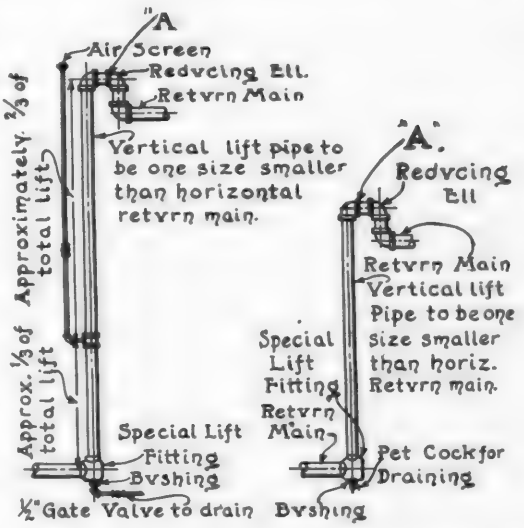


Fig. 1.—Method of Injecting Air Into High Lifts, Where Lift Exceeds 6 Ft.

Fig. 2—For Use Where Lift is 6 Ft. High or Less.

TYPICAL METHOD OF INSTALLING LIFTS, WITH SPECIAL LIFT FITTINGS, IN VACUUM RETURN LINE SYSTEMS.

which, as previously stated, may be usually avoided.

The small ⅛-in. pipe is open to the atmosphere at a point above the upper return main, and admits air to the rising column of water in the vertical pipe. The cock on this small line is but slightly cracked open to admit air only in small quantities. This produces a lightening or aerating effect in the column lifted, similar to that effected by the use of an air lift pump, whereby air at a higher pressure is admitted to the water near its lower level. The inherent expansive force of this air raises the water, and being in bubbles of various sizes it produces a column of water lighter than another of the same height; consequently the water is raised above the level of the surrounding water.

The loops in the piping shown at points "A" are for the purpose of preventing the water from falling back in the vertical pipe as it is lifted. All other necessary directions for the proper installation of these devices are shown in the sketches.

A vacuum in a return main will have a temperature corresponding to the inches of vacuum carried, which ordinarily is about 10 in. Temperature does not affect the operation of these devices, but the higher the vacuum, the greater will be the lift obtainable. Theoretically 1 in. of vacuum will lift 1 ft. of water or static head. In practice this has been exceeded where lift fittings have been used.

If a lifting device is made up of pipe fittings, its run of tee should be two sizes larger than the horizontal return.

Radiation as Figured by Different Rules.

EDITOR HEATING AND VENTILATING MAGAZINE:

In your November issue, you give two tables by different authors for figuring radiation. The first, on page 43, is by Mr. Gifford and I will refer to this as "A." The second is on page 56, which is an explanation of an article which appeared in your September issue, and I will refer to this as "B."

I have taken a typical room, 12 x 15 x 9 ft., with 12-in. brick wall, two 3 x 7 ft. windows with single glass, 12 x 9 ft. exposed wall with west exposure, having a heated room below and an unheated attic above.

I have figured this room by Table A, Table B and Table C. For Table C I have used the old, well-known method of 2-10-200. Following are the results:

TABLE A.

Cubic contents, 1,620 × 1.6	= 2,592
Exposed wall, 108 × 21	= 2,268
Ceiling, 180 × 21	= 3,780
Glass, 42 × 98	= 4,116
	12,756

12,756 ÷ 165 = 77 sq. ft. of radiation.

TABLE B.

Cubic contents, 1,620 × 0.005	= 8.1
Exposed wall, 108 × 0.085	= 9.18
Ceiling, 180 × 0.22	= 3.96
Glass, 42 × 0.39	= 16.38
Sq. ft. of radiation	37.62

TABLE C.

Cubic contents, 1,620 ÷ 200	= 8.1
Exposed wall	108
Ceiling	180
Total exposure	288
Glass, 42 ÷ 2	= 21.0
Exposure, less glass, 246 ÷ 10	= 24.6
	53.7
Add 10% for west exposure	= 5.3
Sq. ft. of radiation	59.0

You will see from the above tables that there is a wide variation in the amount of radiation required when figured by the three methods, especially by the two methods given in your November issue.

If you can give any information as to which of the tables is the more nearly correct or as to where the authors got their information in making up the tables, it will certainly be appreciated. F. W. ROSE.

Minneapolis, December, 1914.

REPLY BY MR. WILDER.

Referring to the table of coefficients given in my recent report, the example as worked out by Mr. Rose is correct.

As to the derivation of the table, the figures in the first column, which represent the B. T. U. loss per square foot per hour per degree difference in temperature, are taken from various authorities on heating and ventilating constants. If you compare these figures with other published constants, you will find that they are a little more liberal than the values usually given.

The figures in Column 2 are derived from those in Column 1 by multiplying by 80—temperature difference—and dividing by 240—B. T. U. allowance per square foot of radiation.

The figures in Column 3 are derived from those in Column 1 in a similar manner, except that 280 is used as the divisor. The figures in Column 2 are for a vapor system of heating and the figures in Column 3 are for a low pressure steam system. The figures in Column 4 give the demand in pounds of steam per hour and are figured as follows:

The figures in Column 1 are multiplied by 80 and divided by 960, it being assumel that 1 lb. of steam will deliver 960 B. T. U.

Work of the Heating and Ventilating Division of Cleveland for 1914.

In the report of Virgil D. Allen, inspector of buildings of Cleveland, Ohio, for the year 1914, after referring to the establishment of the office of heating and ventilating engineer for the city of Cleveland, he states that Cleveland is the second city in the United States to give systematic and special attention to this important subject. Due to the financial condition of the city Inspector Allen states that the department has been unable to establish this subdivision on a basis commensurate with the needs of such service.

Under these conditions the work of T. R. Quay, the city's heating and ventilating engineers was limited accordingly, but Mr. Quay's report shows a number of important actions taken.

The most important work of the year, says Mr. Quay, was the rewriting of the building code with reference to heating and ventilation. This part of the code as finally passed and approved was published in abstract in THE HEATING ANE VENTILATING MAGAZINE for June, 1914. Mr. Quay states that 500 copies of the ordinance, which is No. 29,798, were distributed.

"This new code," continues Mr. Quay, "has been the subject of considerable favorable comment by some of the trade papers, prominent among which are the *Metal Worker* and THE HEATING AND VENTILATING MAGAZINE,

also some unfavorable comments have been made by contractors, principally on account of the fact that a slight additional expense results from building according to the code." Mr. Quay adds that when one or two minor changes have been made, he believes there will be little difficulty in securing its enforcement.

The examination of heating and ventilating plans, continues the report, has been second in importance. This feature of the work was begun March 1. Inasmuch as the old city code, as well as the State building code carried provisions as to heating and ventilating, which were not being incorporated in plans, it was found advisable to suggest to architects and owners the most advisable method of ventilating their buildings, as it was found that few were inclined to have their work designed by experts. Mr. Quay says there have been notably few plans of ventilating systems submitted on which some changes were not required.

Tentative forms have been designed by the division for systematically recording the work of plan examination and as soon as they have proved satisfactory, such a record will be kept.

MORE INSPECTORS NEEDED.

The report states that until money is available to add two heating and ventilating inspectors, the work of inspecting the ventilation of existing buildings must be deferred. This work, says Mr. Quay, is very important and should be taken up at as early a date as possible. He states that he is endeavoring to make at least final inspections on new theatres, picture show buildings, etc., in addition to examining all plans of buildings where ventilation is required.

At Director Stage's request Mr. Quay made a report on the heating and ventilating plans of five new buildings of the City Hospital, on May 22, recommending, among other things, that the heating system be changed from steam to forced hot water. These recommendations were all adopted and considerable time has been required, not only in redesigning this work, but in supervising the erection of same, as well as advising with the director in other branches of the work, such as plumbing, laundry equipment, etc.

Along the same line, Mr. Quay states that he redesigned the heating system of the new machine shop for fire apparatus on Croton Avenue, and, at the request of the Department of Public Service, made the recommendation and wrote the specifications for the necessary changes in the heating system in the City Hall Library building, etc., to accommodate same to the use of steam furnished by the Cleveland Illuminating Company. He has also acted in an advisory capacity at the City Hospital, recommending certain changes in the mechanical equipment of the present buildings, prominent among which have been the heating of the Tuberculosis Sanitarium from the power house and the changes in gas burners, increasing the efficiency of the boilers.

The report shows that during the year 77 heating and ventilating inspections were made.

The Needs of the Heating Profession.

What amounts to a fairly complete summary of the needs of the heating profession is contained in a recent report of a committee of the New York Chapter of the heating engineers' society which is at work on what will be practically a code of ethics for the engineer.

Among other things the committee discusses the question of a legal license for engineers to practice and what the requirements should be for such a license. Regarding the direct employment of engineers, it is pointed out that engineers should have the same authority in deciding engineering questions as is accorded other professional men in the decision of matters pertaining to their work. As a general proposition, it is urged that all engineering work should be placed in the hands of its own specialists. As a step towards accomplishing this end, it is proposed to find out what percentage of engineering work is being handled indirectly by engineers and what consideration is being given engineers.

The matter of fees is to be taken up to determine whether the prevailing fees are productive of work which is satisfactory to the client and creditable to the profession.

It is proposed to look into the question as to whether the science of heating and ventilating, as generally practiced, is productive of as good design as it should be and how much the demand for low cost is preventing the most economical use and thus proving a detriment to the profession.

It is felt that under existing conditions, the engineer is unfairly burdened with the responsibility for the co-operation of his work with that of others, and that much of his time and energy are being spent which is not appreciated or paid for. In addition to investigating this subject, the committee expects to deal with the question as to whether the engineer should be required to give a bond covering the proper operation of work under his charge.

The separation of contracts is another matter proposed for investigation and if the engineering contracts should be separated, whether there should be further sub-divisions of contracts.

In all of the steps proposed the question will come up of the enlistment of the co-operation of the associated professions and trade organizations. The question how this can best be done is one of the matters that will have to be decided before the matters are brought to a final issue.

The committee, which is known as the Committee on the Profession's Efficiency and Welfare is composed of Perry West (chairman), Frank K. Chew and J. I. Lyle.

Massachusetts Chapter.

A discussion on "Public School Ventilation," which formed the topic for the December meeting of the Massachusetts Chapter brought out a full attendance of members, and in addition forty guests were present from the engineering departments of the city and State. The meeting was held at the Revere House, Boston, and followed a chapter dinner.

Eugene C. Baldwin, of the State Board of Education, was the principal speaker. He declared that the ventilation of the Boston public schools is not satisfactory and said that no system has been invented that is not being used in some one of the Boston schools. The school board, he said, is dissatisfied with them all.

Mr. Baldwin declared that Massachusetts is behind in its present rural school system and expressed the hope that the Board of Education would be instrumental in bringing together the chapter, the board of health and the district police in a movement to effect improvement in ventilating methods.

Other speakers were ex-Mayor Eugene Stone of Quincy, vice-president of the Massachusetts Chapter, who presided; Major J. W. H. Myrick, Commissioner of Public Works Louis K. Rourke; John H. Plunkett, deputy chief of the Massachusetts District Police.

S. H. Wheeler, of Fairfield, Conn., showed lantern slides of schoolhouses he has planned and built in that State.

The N. A. S. O. Standard First-Aid Jar.

A first aid jar, made of glass, has recently been designed which though only about 9½ in. in diameter and 6 in. high, contains every material which a large conference of physicians has agreed upon as necessary for effective first aid treatment. It is known as the N. A. S. O. standard first aid jar, owing to the fact that it has been standardized by the conference board on safety and sanitation and accordingly stamped with the National Affiliated Safety Organizations mark. These jars may be secured from the secretary of any of the associations comprising the conference board, namely: The National Founders' Association, 20 South La Salle Street, Chicago; The National Association of Manufacturers, 30 Church Street, New York; The National Metal Trades Association, Peoples Gas Building, Chicago; and the National Electric Light Association, 29 West 39th Street, New York. They are sold at prac-

N. A. S. O. STANDARD FIRST-AID JAR.

tically cost price, as there is no intention to make a profit on any of the articles standardized by these associations.

American Society of Mechanical Engineers.

The first woman to be elected a member of The American Society of Mechanical Engineers attended the thirty-fifth annual meeting of the society, which was held in New York, December 1-3, 1914. She is Miss Kate Gleason, secretary of the Gleason Works, Rochester, N. Y. Miss Gleason is a graduate of Cornell University where she took the mechanical engineering course and is manager of the large plant of which she is secretary.

The new officers of the society, elected at the annual meeting, are: President, John A. Brashear, Pittsburgh, Pa.; vice-presidents, Henry Hess, Philadelphia; George W. Dickey, New York; and James A. Sague, Poughkeepsie, N. Y.; managers, Charles T. Main, Boston; Spencer Miller, New York; Max Toltz, St. Paul, Minn.; and Morris L. Cooke, Philadelphia; treasurer, William H. Wiley, New York.

Plans of the International Engineering Congress.

Some confusion seems to have arisen in the minds of at least certain of the engineers of this country, between the International Electrical Congress, which it was proposed to hold in San Francisco in September, 1915, and the International Engineering Congress, which is to be held during the same month.

Owing to the unfortunate situation existing abroad, and the impossibility of convening the International Electrotechnical Commission, under whose authorization the electrical congress was to have been held, it has been decided by the governing body of the American Institute of Electrical Engineers to indefinitely postpone the holding of the electrical congress. This does not affect the International Engineering Congress, which goes ahead as originally planned.

Ownership of the New York Steam Company.

In connectiong with the hearings before the New York Public Service Commission of the First District, which resulted in the commission's order to the New York Steam Company that it must replace its mains with a modern form of underground pipe construction, it was brought out that about two-thirds of the stock of the steam company is held by the Andrews Institute for Girls, a charitable institution near Cleveland, O. The president of the company, G. C. St. John, owns another large block and the remainder is held by about 130 small stockholders. It is said never to have paid any dividends, and the last sale of stock reported was at the rate of $1.50 a share. It has long been a matter of speculation on the part of the general public as to who were the owners of this company. The company maintains in all about 12.7 miles of steam mains divided into two systems and served from two stations.

The New York Steam Company was formed in 1881 with an authorized capital of $7,500,000 to take over the franchise of an earlier company, which, however, had done no operating.

Bibliography on Air Conditioning.

A notable bibliography on air conditioning, with references to books and magazine articles, appeared in the Monthly Bulletin of the Carnegie Library of Pittsburgh, for November, 1914, and has since been published in pamphlet form. Although the bibliography is confined to material in the Carnegie Library of Pittsburgh, it is remarkably complete for the field it covers which is that relating to the conditioning of air supplies for buildings. It does not attempt to cover mine, subway or railway car ventilation, or the cooling of air for cold storage or for other industrial purposes.

It is a matter of interest to note that the references to articles appearing in THE HEATING AND VENTILATING MAGAZINE total 86, or more than those credited to any other journal.

The pamphlet is listed in the library's reference list as obtainable for 10 cents, postpaid. It contains 58 pages.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

AIR CONDITIONING—

Wet Air-Filters. Describes recent types for air purification. Ills. 1,200 w. Engng—Oct. 23, 1914. 40c.

FANS—

Fans for Ventilating Work. C. L. Hubbard. Describes forms used for ventilationg, type of motor best suited, and gives rules for determining the capacity and driving power required, etc. 2,200 w. Eng Mag—Dec., 1914. 40c.

GAS HEATING—

Possibilities of Auxiliary House Heating by Gas. W. H. Schofield. Discusses the application to house heating. 1,500 w. Am Gas Ltg Jour—Nov. 16, 1914. 20c.

Water Heating by Gas. H. R. Basford. A paper of value to the salesman in showing the efficiency and comfort of such a device. Ills. 5,000 w. Am Gas Lgt Jour—Nov. 16, 1914. 20c.

VENTILATION—

Possibilities in Ventilation. Extracts from a lecture by Arthur H. Barker. Considers conditions which must give satisfactory ventilation. 4,000 w. Archt, Lond—Nov. 6, 1914. 40c.

NEW DEVICES

A New Method of Measuring High Temperatures.

A new method of measuring temperatures wherever heat is applied has just been developed by the Carl Nehls Alloy Co., Detroit, Mich. It provides for the use of different kinds of metallic salts, which are made into molecular mixtures that will melt down at different temperatures throughout the range between 220° and 1,330° Centigrade. Practical means have been devised for using them in place of the more costly pyrometers. They are also very useful for checking pyrometers. Then a cylinder is placed at the end of the thermo-couple and when it melts the pyrometer should read the same as the temperature marked.

One way is to cast them into solid cylinders 7/16 in. in diameter and ¾ in. long, as shown by those standing on end in the accompanying illustration. Each one is wrapped in a paper on which is printed its correct melting temperature in degrees, Centigrade, as shown by the samples. For all temperatures below 932° F. the Sentinel Pyrometers, as they are known, can be used in an air-tight glass tube, such as is shown in the centre. The salts can then be used over and over again. By using the small porcelain saucers shown, the salts do not run to waste and litter up the place where they are used. This also enables them to be used several times, as the salt melts each time the temperature rises above the one marked on the cylinder and becomes solid again the moment the temperature falls below this degree.

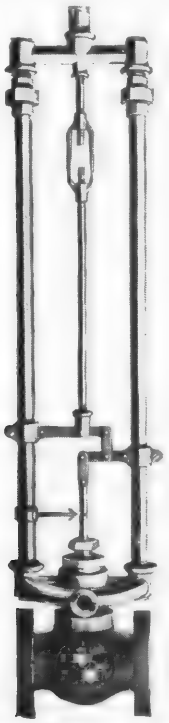
These salts are also made up in the form of a paste. Enough to make several hundred determinations is packed in the tins shown. Pastes with various melting temperatures can be daubed along a steel bar, as shown in the front of the picture, and inserted into furnaces, ovens, retorts, flues, gas mains, steam pipes, etc., to find the temperature at which they are operating. The salts that melt down and those that remain solid will indicate the temperature, which would be between the two. By using a long bar one can determine whether the temperature is uniform in the front and back, top and bottom, or corners of a furnace, oven, kiln, etc.

New Type of Feed Water Regulator.

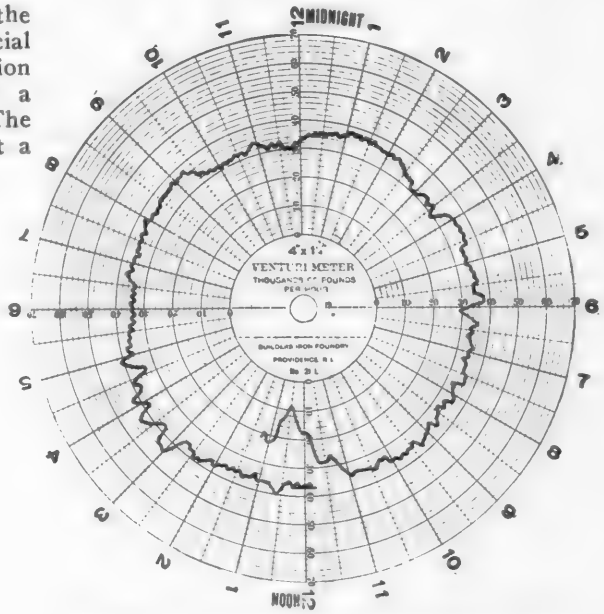
A thermostatically-controlled feed water regulator, designed not only to secure a continuous feed, but positive automatic control of such feed to vary with the boiler load, has been placed on the market by the McDonough Automatic Regulator Co., Detroit, Mich. It is sold under the trade name of the World's Best. It is emphasized that for sudden increases in load and resulting rapid drop in the water level, the regulator valve does not open suddenly, but there is a time element in

SENTINEL PYROMETERS AND PASTE FOR MEASURING HIGH TEMPERATURES.

the expansion of the tubes operating the valve. The regulator consists of a special feed valve, two headers and two expansion tubes connected in parallel through a rigid linkage to the feed valve stem. The turnbuckle and pointer indicator permit a very accurate adjustment of the valve.

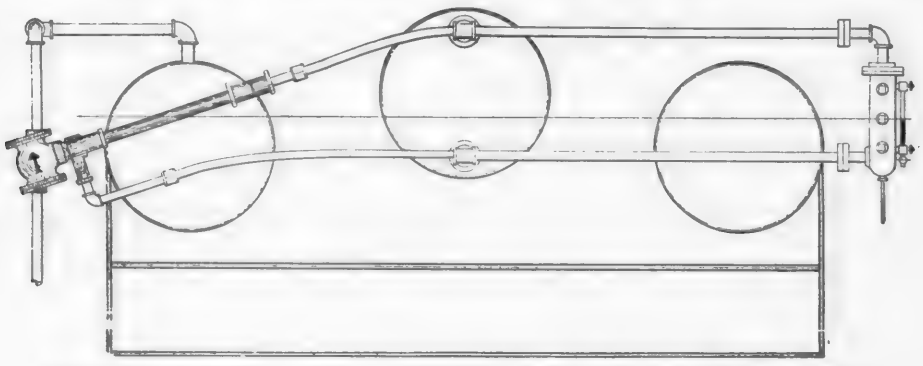


McDONOUGH FEED WATER REGULATOR COMPLETE.



VENTURI METER CHART SHOWING REGULATION OF FEED ON TWO BOILERS EQUIPPED WITH McDONOUGH REGULATORS.

The regulator is installed in an inclined position, wholly supported by the feed piping, with the connections made to the water column, as shown. In operation the lower end of the tubes are filled with water and the upper with steam. As the water falls or rises in the boiler, it correspondingly falls or rises in the regulator tubes, presenting a greater or less area of the tube surface to the hot steam, causing them to expand and contract accordingly. The inclined position of the regulator gives the greatest variation in exposed tube surface for a given variation in water level and the greatest sensitiveness to variations in load.



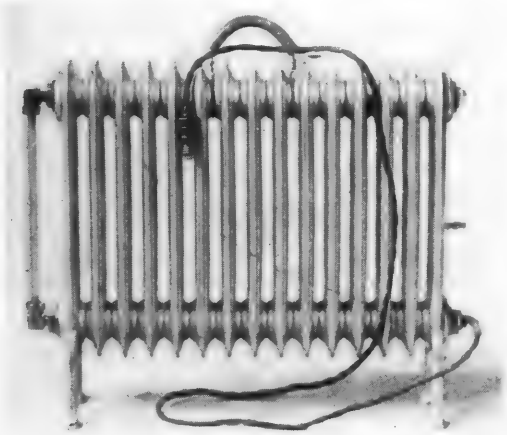
METHOD OF INSTALLING McDONOUGH FEED WATER REGULATOR

No Care Electrical Steam Radiator.

A type of electrical steam radiator, which is described as portable, dustless, noiseless and odorless, has been placed on the market by the Electrical Steam Radiator Co., 644 Congress street, Portland, Me. It is pointed out that it is of special

value as an auxiliary heater. The company reports interesting results of a test made on its household type of radiator, 15 sections, 1,000 watts, 110 volts, having a radiating surface of 18 sq. ft. The height of the radiator was 20 in. The amount of cold water used was 1½ quarts, and it was brought to a boiling point in 17 minutes.

When placed in a room of 2,500 cu. ft, capacity, where at the beginning of the test the temperature was 55° F., this temperature was raised in 1 hour and 20 minutes to 64°. The watts taken by the radiator at the normal voltage, as marked in name plate, was practically 1,000 watts,



NOCARE ELECTRIC HOT WATER RADIATOR.

varying a few per cent above and below as the voltage of the supply rose and fell.

Another test made by the meter department of the Cumberland County Power and Light Co. on a 15-section radiator, 20 in. high, containing 1½ quarts of water and having 18.7 sq. ft. of radiation. On 122 volts the radiator drew 1,070 watts, and on 116 volts it drew 1,040 watts. The radiator was heated for three hours. It started to boil the water in 15 minutes and at the end of the test the steam gauge showed a pressure of 6 lbs.

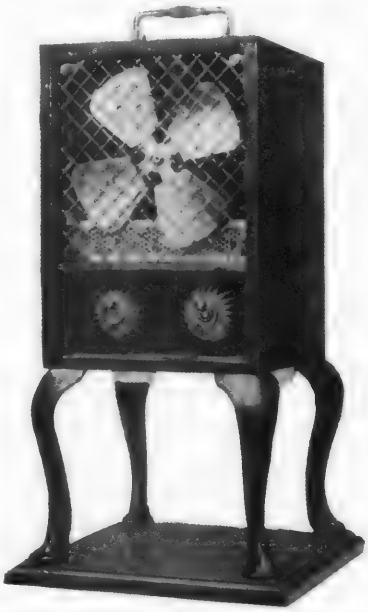
The Nocare electrical steam radiator is made in six sizes, running from 14 to 32 in. high and containing from 10 to 15 sections. It is noted that 300 to 500 watt radiators may safely be attached to the ordinary light sockets.

Harral Pipe Cleanser.

An interesting product for cleansing clogged waste pipes and also for removing accumulations of grease and dirt from machinery, is manufactured by chemical department of the Harral Soap Co., 467 Greenwich Street, New York, and is being sold in the New York district by S. D. Robertson, formerly with the Nason Mfg. Co., New York. The Harral pipe cleanser is a chemical which, when mixed with water, forms a solution hotter than boiling water and eats away all kind of waste matter without injuring the piping or machinery. It is also effective in thawing out frozen pipes. It is stated that a weak solution will not freeze in 10° F. below zero, while stronger solutions will resist lower temperatures in proportion. Mr. Robertson reports a wide sale of this product and uniformly successful results obtained by its use.

Trade Literature.

DEODORIZATION BY THE OZONAIR SYSTEM is the title of an interesting treatise and catalogue featuring the apparatus manufactured by Ozonair, Ltd., 96 Victoria Street, Westminster, London, S. W. The circular takes up the discovery and application of ozone, dividing the ap-



TYPE OF PORTABLE OZONAIR MACHINE DESIGNED FOR DINING ROOMS, SICK ROOMS, ETC.

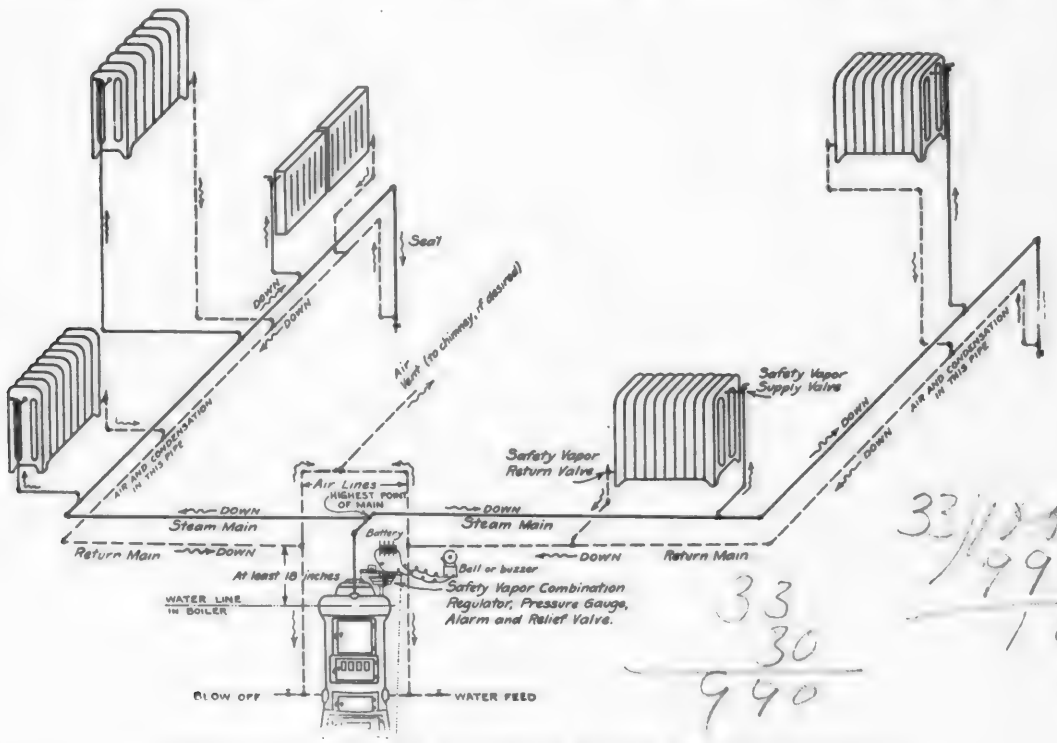
plications into (a) domestic and general, covering private houses, mansions, hotels, restaurants, railway trains, ships etc. and (b) commercial and industrial treating of the trouble caused by the handling or storage of such articles as hides skins, etc., or incident to the carrying on of what are known as offensive trades. In the present catalogue the applications are confined to those using portable apparatus and it is stated that with this type, the average cost of producing strongly ozon-

ized air does not exceed one six-hundredth part of a penny per 1,000 cu. ft. Full directions are included for the guidance of the user in selecting the size and type of apparatus and the illustrations show the differences in each type. Size 8¼x10¾ in. Pp. 16.

IMPROVED TYPE OF ADSCO GRADUATED RADIATOR VALVE.

ADSCO GRADUATED RADIATOR VALVES, improved type, used in connection with the atmospheric system of steam heating, are featured in a new circular issued by the manufacturers, the American District Steam Co., North Tonawanda, N. Y. This valve travels from closed to full open with a three-quarter turn and a pointer indicates any fractional position between the two extremes. It is recommending as affording absolute control of individual radiators, permitting the flow of just the amount of steam needed in each radiator to maintain the desired temperature. The valve, it is stated, will not become clogged, or stick after remaining idle. Their various capacities are arranged in multiples of 5 sq. ft. of direct radiation, which have been established as the result of extensive tests to determine the ratio of the amount of steam under given pressure through the radiator valve, to the amount of steam condensed per square foot of radiation under maximum demand conditions. The valve is listed at $5.00.

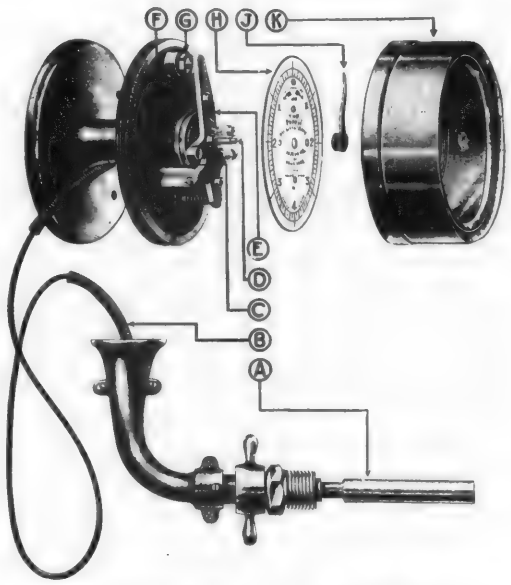
SAFETY VAPOR HEATING SYSTEM, one of the most recent additions to this method of steam heating, is fully described in a catalogue received from the manufacturers, the Safety Vapor Heating Co., 73 West Eagle Street, Buffalo, N. Y. The manufacturers state that while this system follows the general principles of other vapor heating systems, the devices or means by which this principle is applied are noteworthy. The Safety vapor regulator, for instance, is made entirely of metal, with no rubber diaphragm or rubber connections, and may be expected to respond to a change of pressure of less than ¼ oz.



TYPICAL LAYOUT OF A SAFETY VAPOR HEATING SYSTEM.

As shown in the view given herewith of a typical installation, this regulator is connected directly to the steam dome of a boiler by a short nipple. The front end of the lever is connected by a chain or cable to the draft damper in the ash pit; the rear end to the check in the smoke hood. On the front of the regulator is a mercury gauge glass showing the pressure in the boiler in ounces. The wires marked show the two electrical connections to the alarm. When the mercury in the gauge glass rises to a predetermined point, contact is made and a buzzer or bell will warn those in the house that the system is being mistreated. If, however, this is not heeded, pressure will be relieved through the opening in the top. The Safety vapor supply valve is made in one size, ¾ in., one simple adjustment on the outside of the valve being all that is necessary to adapt it to any size of radiator. Other devices included in this system are the Safety vapor automatic alarm, already mentioned; and the Safety vapor relief, to allow the excess steam to escape when the pressure rises above 8 oz. Size 3½x6¼ in. Pp. 24.

PERFECT AUTOMATIC CONTROLLER FOR TEMPERATURE AND FOR PRESSURE is the subject of a new bulletin (No. 297) published by the C. J. Tagliabue Mfg. Co., 18-88 Third St., Brooklyn, N. Y., in which this interesting system is described in detail. It is intended for use wherever the temperature to be maintained lies between 100° F. and 400° F., and, with slight modifications, it may be used for any value of pressure within the limits of commercial practice. This apparatus, like all other Tagliabue automatic temperature controllers, operates by automatically adjusting a valve or damper that regulates a tempering medium, such as steam hot or cold water, hot or cold air, etc. A typical application of the controller to a tank that is heated by steam is shown in the accompanying illustration. The Tagliabue simplex pressure controller is used to keep the steam at a constant pressure independent of the boiler fluctuations. Before starting the plant for the first time, the adjusting post is set for the temperature that it is desired to maintain. When the tank is cold and, therefore, the temperature is not



A—Thermostatic bulb.
B—Thermostatic tube.
C—Vapor Capsule.
D—Adjusting Post.
E—Transmitting Lever.
F—Spring.
G—Air Pressure Regulator.
H—Dial.
I—Pointer.
K—Cover.

MECHANISM OF PERFECT TEMPERATURE CONTROLLER.

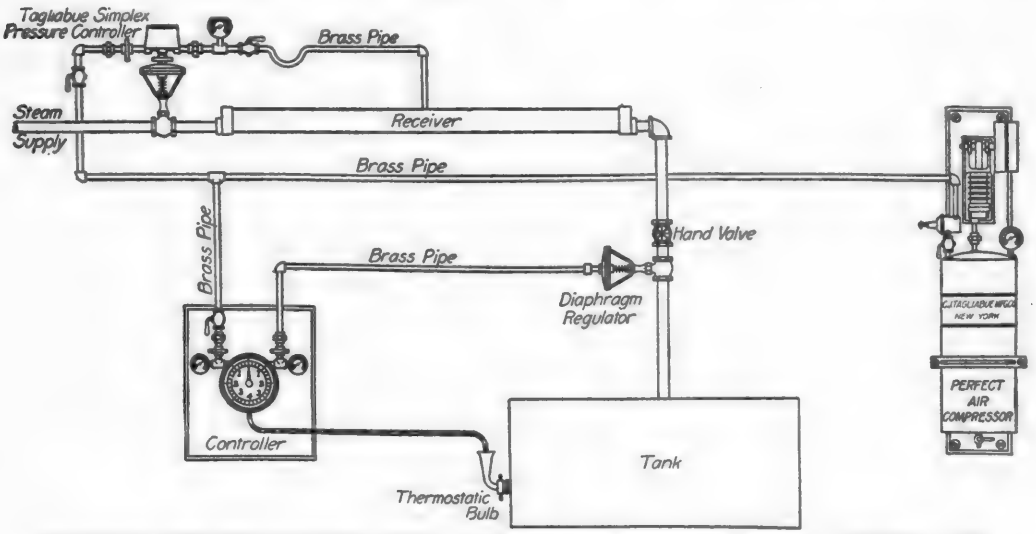


DIAGRAM SHOWING OPERATION OF PERFECT TEMPERATURE CONTROLLER.

sufficient to vaporize the liquid in the thermostatic bulb, no pressure exists in the thermostatic system; that is the vapor capsule is contracted beyond contact with the adjusting post. In this position the spring holds the ball tightly against the air inlet port and thus no air pressure is admitted to the top of the diaphragm, which is held wide open by the combined action of the coil spring on its stem and the pressure of the entering steam.

As the tank temperature rises and approaches the desired degree the liquid in the thermostatic bulb vaporizes and establishes a pressure in the system that corresponds to the temperature of the medium in which the bulb is immersed. The action of this pressure is to expand the top of the vapor capsule and bring it into contact with the adjusting post, thus forcing the lever away from the valve pin and allowing the ball to rise and admit air pressure to the diaphragm motor, thereby partly closing the steam inlet valve. The pressure in the controlled line that leads to the diaphragm motor is less than the initial air pressure because of the throttling action of the ball and also because of the leakage through the upper port of the valve chamber provided for that purpose.

When the temperature reaches its proper value, the vapor pressure in the thermostatic bulb corresponding to that temperature keeps the ball at an intermediate position which in turn supplies air to the diaphragm motor at an intermediate pressure, thereby keeping the steam valve open just enough to maintain the temperature.

The slightest variation above or below normal temperature will cause an instant and corresponding variation in the vapor pressure and therewith a like variation in the position of the ball so as to continually vary the opening of the steam valve in such a way as to keep the temperature always at the correct degree.

The use of a saturated vapor and of a patented air pressure regulating valve are emphasized by the manufacturers as being the important points of excellence of this system. The use of a saturated vapor, it is stated, results in great sensitiveness, adaptability, durability and flexibility, while the type of air pressure regulating valve used is notable for its simplicity, absence of mechanical friction, reliability and accuracy. Size 8½ x 11 in. (standard). Pp. 16.

Other recent bulletins issued by the C. J. Tagliabue Company are No. 310, on "Instruments for Steam Plant Use," including thermometers, temperature controllers, pressure controllers, pyrometers, thermoscopes and syphon draft gauges; and No. 216 on "How It Works," being devoted to the company's Faultless temperature controller, built on the expansion stem principle. Size of both bulletins, 8 x 11 in. (standard). Pp. 48 and 24, respectively.

FOXBORO THERMOMETERS AND THERMOGRAPHS, containing several new and important improvements, are illustrated and described in a new bulletin (No. 91) published by the Industrial Instrument Company, Foxboro, Mass. Special attention is called to the fact that in the construction of these instruments no mercury is used, the principle involved permitting a much wider range of use, especially with the long-distance types, as the readings are not affected by the temperatures surrounding the instruments. Each part is taken up separately and views given showing clearly the construction of each part. There are also a number of typical records made by the recorders in actual service. Size 8x11 (standard) pp. 52, punched for binding. Another recent publication is devoted to the Foxboro differential recording gauges and orific meters for gas. These instruments are designed to record with precision the differences in pressures obtained by the use of orifice plates, Pitot tubes or Venturi throats with an accuracy heretofore impossible, permitting the measurement of the velocity and volume of liquids or gases flowing through pipes under pressure; also to record the heights of liquids in vessels under pressure, such as the height of water in a steam boiler. Size 8x11 in. (standard). Pp. 20, punched for binding.

MARSH REFLUX AUTOMATIC RETURN LINE THERMOSTATIC TRAP, for use with graduated control, vacuum, modulation, vapor and atmospheric systems of steam heating, are the subject of a circular devoted to this device, published by the manufacturers, Jas. P. Marsh & Co., Chicago, Ill. The valve is operated by means of the expansion and contraction of the diaphragm produced by the vaporization and condensation of volatile liquids. The expanding diaphragm, it is stated, has been used for fifty years in the construction of locomotive gauges. A unique feature of the valve is its fluid reservoir which, together with the composition seat, relieves the force of the expanding member. This reservoir is a tube, containing, with the diaphragm, the volatile liquids. An accompanying illustration shows a typical heating layout equipped with the Marsh reflux traps.

PAGE VOLUNTEER AND MONARCH BOILERS, for steam and hot water heating, are described and illustrated in a complete and handy catalogue covering the products of the Wm. H. Page Boiler Co., New York. The prices are those for 1915. All of the necessary data are included, both for the Volunteer round type and

HARVARD FRESHMAN DORMITORIES.

the Monarch sectional type, while 21 pages are devoted to miscellaneous information for the steam fitter. Size, 4½ x 7½ in. Pp. 80.

Incorporation of Almirall & Co., New York.

Due to the death of the late Quimby N. Evans, it is announced that the co-partnership heretofore existing between Q. N. Evans, J. A. Almirall and W. C. Adams has been dissolved and the corporation of Almirall & Co., Inc., has succeeded to that business. The new corporation has the same personnel as the former co-partnership and is prepared to carry on the business with the same dispatch, thoroughness and integrity as characterized the former company. The company's activities include the design and installation of heating, ventilating and power plants, sprinkler systems and forced hot water heating systems. The new corporation is capitalized at $200,000 and the incorporators are J. A. Almirall, W. C. Adams and W. J. Wood, all of New York. The present quarters of the company at 1 Dominick street, New York, will be maintained.

Large Pipe Covering Contract.

The pipe insulation contract for the new Utah State Capital at Salt Lake City, for which R. K. A. Kletting was the architect and the James C. Stewart Co. the contractors, was recently awarded to the H. W. Johns-Manville Co., New York. The high pressure pipes will be covered with J-M asbesto-sponge felted pipe covering, a product made up of lamenations of felt composed of asbestos and finely-ground sponge. The materials being naturally cellular, they form the basis for the claim as to the large number of "dead air" cells they contain, and therefore their high heat insulating value.

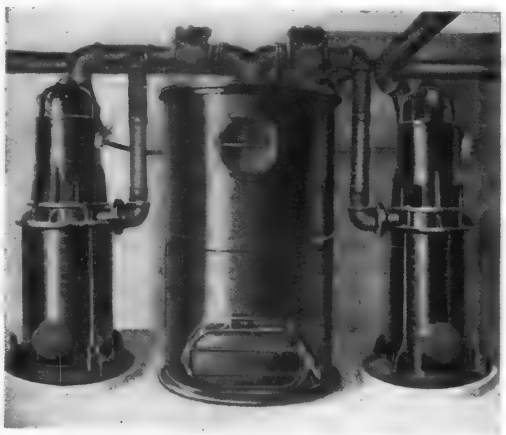
The heating pipes will be covered with J-M asbestocel pipe covering, which is built up on the arch principle. Sealed air channels run around the pipe, instead of parallel with it, thus preventing the circulation of air and consequent heat radiation.

Test of Vacuum Cleaning Plant.

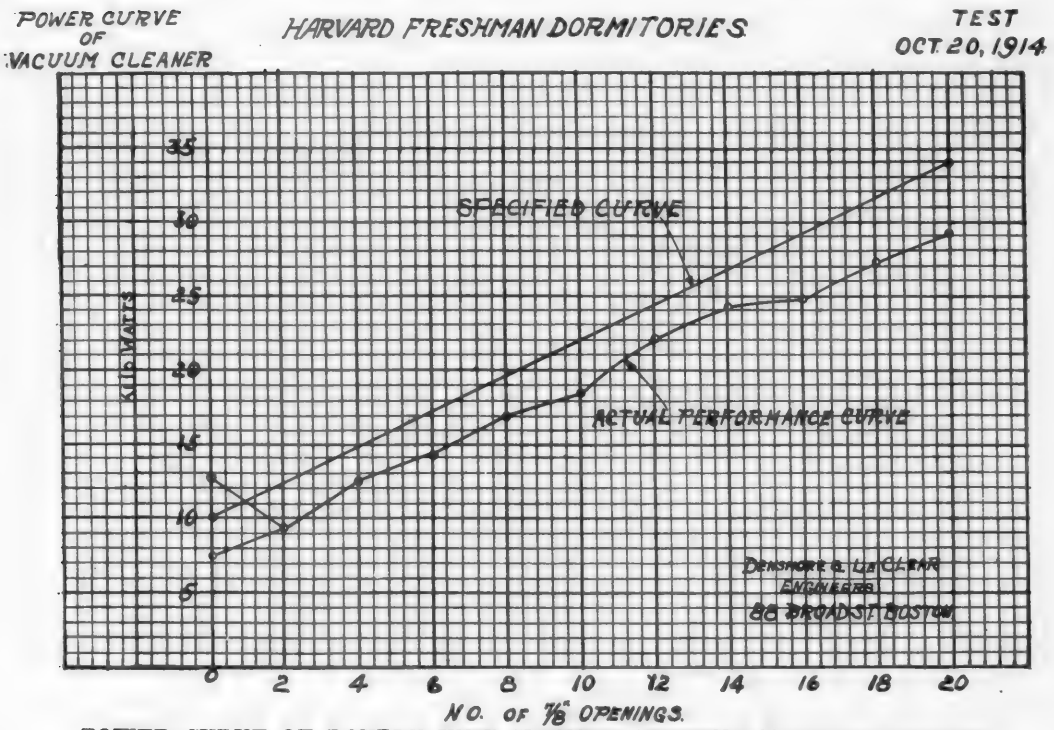
An interesting test was recently made of a vacuum cleaning installation at the Harvard Freshman Dormitories. These buildings, only two-thirds of which are shown in the accompanying illustration, are cleaned by one central plant of the Spencer turbine type. This test is of more than usual interest in view of the thorough manner in which the vacuum cleaner problem was investigated by the engineers at Harvard College before awarding the contract.

As setting a high duty standard, it was found, in the official test, that this plant maintained a little more than 2 inches of vacuum at the end of twenty 50-ft. lengths of 1½ in. hose, with ⅞-in. sharp-edged open orifices through ⅛-in. plate, with an electric current input of 1½ K. W. (about 1½ brake H. P.) per sweeper. The plant also maintained a little over 3 in. of vacuum at the end of twenty 50-ft. lengths of hose with similar ⅝-in. open orifices, with a current input of less than 1 H. P. per sweeper. The test was made with a standard 4-in. globe type vacometer.

An important point demonstrated by the test



SPENCER TURBINE VACUUM CLEANING INSTALLATION IN HARVARD FRESHMAN DORMITORIES.



POWER CURVE OF DOUBLE UNIT SPENCER TURBINE VACUUM CLEANER INSTALLED IN HARVARD FRESHMAN DORMITORIES.

was that the inherent characteristics of this equipment are such that the correct proportion of vacuum to volume at the end of the hose changes automatically as the operator changes from bare floor to carpet sweeping. It is well known that bare floor sweeping requires a different proportion of vacuum to volume of air at the end of the hose than with carpet sweeping.

In testing the uniformity of sweeping value delivered at all the buildings and at every outlet on the system, it was found that there was a variation in vacuum of less than ⅜-in. whether near the machine or 1,500 ft. away.

The separation test showed an efficiency of 98¾%, without the use of cloth bag screens or water. The accompanying chart shows the curve specified by the engineering authorities of the college. It will be noted that the performance curve just below it shows that this plant exceeded the requirements by a considerable margin.

The cleaner plant at the Harvard Freshman Dormitories was designed and installed by the Spencer Turbine Cleaner Co., Hartford, Conn.

Dinner to Pierce, Butler & Pierce Manager.

The transfer of George W. Crane as manager of the New York office of the Pierce, Butler & Pierce Mfg. Corporation to his new duties as assistant general sales manager, with headquarters at Syracuse, N. Y., was made the occasion of a testimonial dinner tendered Mr. Crane by his associates at the Hoffman House, December 11. Mr. Crane while acting as assistant sales manager for some time, has been in charge of the New York branch for the past six months. Covers were laid for twenty-four, including J. T. Duryea, president of the corporation. The toastmaster was John G. Kelley, manager of the plumbing department. At the conclusion of the dinner Mr. Crane was presented by President Duryea on behalf of the diners with a set of cuff links and a scarf pin.

Central Heating Trade Notes.

Alton, Ill.—An agreement has been reached between the Alton hot water heating system and its patrons. The patrons objected to paying for heat during September. The agreement reached was that the patrons should pay for that month, but that thereafter the company would give a rebate for the time the system was not in good working order.

Cleveland, O.—It is stated that the new $2,000,000 City Hall Building may be without heating facilities on its completion in 1916 if the City Council stands firm in its policy of refusing the Cleveland Electric Illumination Co. permission to extend its heating mains. The ordinance as passed by the Council had a purchase clause at-

tached, and this was refused by the illuminating company. Mayor Baker states that the city's heating plant will not be in a position to furnish heat to the downtown district within the next ten years.

Seattle, Wash.—Resolutions similar to those previously adopted by the Electrical Workers' Union, No. 77, noted last month, advocating the ownership and operation by the City of Seattle of a municipal steam heating plant, have been adopted by Steam Engineers' Union, No. 40. The plan as favored by the engineers is the construction of an initial plant in some specified district and the gradual extension of the system over the entire city.

North Yakima, Wash.—The local Electrical Workers' Union has gone on record as favoring the proposed franchise of the Central Heating Co. to engage in the business of furnishing electrical power. It is believed that if the company enters into a bona fide competition with the P. P. & L. Co., the city will derive some benefit from the competition, and should the present company eventually sell out, the city will have the first option to buy and operate a municipal plant.

Alton, Ill.—A thorough overhauling of the Alton hot water heating system is indicated by Assistant General Superintendent Myers of the Gas and Electric Co. The underground mains, it is stated, are in bad condition.

ADVERTISERS' INDEX

American Blower Co..... 72
American Radiator Co.....Back Cover
Armstrong Mfg. Co..... 63

Best, John 78
Bicalky Fan Co. 12
Bishop-Babcock-Becker Co. 64
Books on Heating and Ventilation 81
Bristol Co., The.....Front Cover
Buffalo Forge Co..... 5
Buffalo Steam Pump Co..... 6

Carrier Air Conditioning Co..... 5
Century Ventilating Co..... 80
Connersville Blower Co..... 3

Davis Regulator Co., G. M..... 9
Detroit Lubricator Co. 66
Dixon Crucible Co., Joseph..... 78
Dunham Co., C. A..... 12

Fisher-Sweeney Bronze Co..... 1
Foster Engineering Co. 8

*Garden City Fan Co..... —
Globe Ventilator Co.....Front Cover
Gurney Heater Mfg. Co.....Front Cover

Hackney Ventilating Co..... 3
Hornung, J. C. 9

Ilg Electric Ventilating Co..... 4
Industrial Instrument Co. 65
Iroquois Engineering Co. 68

Jenkins Bros. 65
Johns-Manville Co., H. W..... 79
Johnson Service Co. 75

Kelsey Heating Co. 75
Knowles Mushroom Ventilator Co., Front Cover

Lavigne Mfg. Co. 81

Marsh & Co., Jas. P..... 6
Michigan Pipe Co.....Front Cover
Molby, E. C..... 10
Moline Vacuum Vapor Heating Co..... 7
*Monash Engineering Co..... 1—
Morehead Mfg. Co. 7
Mouat-Squires Co. 7
Mueller Mfg. Co., H..... 8

Parker Supply Co. 82
Patterson & Co., Frank L..... 77
Patterson Publishing Co. 79
Powell Co., The Wm..... 79

Ross Valve Mfg. Co.....Front Cover

Scaife & Sons Co., Wm. B..... 66
Sims Co., The..... 76
Spencer Turbine Cleaner Co..... 80
Standard Thermometer Co..... 80
Standard Wood Pipe Co. 79
Sturtevant Co., B. F.....71-73
Syracuse Faucet & Valve Co..... 82

United Vacuum Appliance Co..... 10

Webster & Co., Warren..... 69
Wells & Newton Co..... 67
Westinghouse Electric & Mfg. Co..... 74
Wyckoff & Sons Co., A..... 78

Zellweger & Sons, J..... 67

* Every other month.

TRADE AND MISCELLANEOUS NOTES

Coming Events.

January 20-22, 1915—Annual meeting of the American Society of Heating and Ventilating Engineers, at the Engineering Societies Building, 29 West 39th Street, New York.

Third Monday in Each Month—Meeting of the New York Chapter, American Society of Heating and Ventilating Engineers, Engineering Societies Building, New York (evening). No meeting in January. Subject for February meeting: "Methods of Measuring Air Velocities and Window Leakage."

Second Monday in Each Month—Meeting of the Illinois Chapter, American Society of Heating and Ventilating Engineers, in Chicago (evening).

Third Tuesday in Each Month—Meeting of the Massachusetts Chapter, American Society of Heating and Ventilating Engineers, in Boston (evening).

Deaths.

Joseph H. Glauber, general manager of the Glauber Brass Mfg. Co., Cleveland, O., died in Seattle, Wash., November 27, while on a business trip. His death was caused by pneumonia, following an operation for appendicitis. Mr. Glauber was 43 years old. He leaves a widow and four children, also a brother, H. Glauber, who is treasurer of the Glauber Brass Mfg. Co., and a sister. He was one of the organizers of the company with which he was associated and which was formed in 1890. He was also a past president of the National Association of Brass Manufacturers.

R. T. McCabe, father of D. E. McCabe, manager of the Chicago branch of the International Heater Co., and of J. B. McCabe of the Kewanee Boiler Co., died at the home of his son, D. E. McCabe, November 24, at the age of 82 years.

Charles A. Moore, president of Manning, Maxwell & Moore, New York, manufacturers of railway supplies and machine tools, died December 1 of heart disease, on board the steamer Rotterdam, while on his way to Naples. Mr. Moore was also associated with the Ashcroft Mfg. Co., the Hancock Inspirator Co., and the United Injector Co. He was 69 years old.

Col. Edward D. Meier, president and chief engineer of the Heine Safety Boiler Co., St. Louis, Mo., and a past president of the American Society of Mechanical Engineers, died at the home of his daughter, Mrs. William Schevill, in New York. His death was caused by hardening of the arteries and heart disease. One of the last and most important of Col. Meier's achievements in the field of engineering was the design and installation of 10,000 H.P. of boilers in the power house of the new Grand Central Terminal in New York. In 1913 Col. Meier accompanied the members of the mechanical engineers' society to Germany where joint meetings were held with the German society. Col. Meier was born in 1841. He obtained his rank of colonel in the Civil War. He organized the Heine Safety Boiler Company in 1884 and has been its president and chief engineer ever since.

Genuine Armstrong Stocks and Dies

MALLEABLE HINGED PIPE VISES

PIPE CUTTERS

PIPE MACHINES, HAND OR POWER

The Tools of Constant Service

Manufactured by **Write for Catalog**

THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Miscellaneous Notes.

Buffalo, N. Y.—According to an ordinance recently passed in Buffalo, the commissioner of public works is given authority to appoint chief engineers and assistants to have charge of the heating and ventilating plants and other machinery in the new high schools of Buffalo. These men will be under the immediate direction of the master mechanic in the bureau of buildings.

Boston, Mass.—A solution of the heating system problem at Deer Island has been effected by Acting Engineer Hackett of the Deer Island House of Correction, whereby the city, it is figured, will save $180,000 the first year and from $10,000 to $15,000 each year thereafter. This problem has puzzled the engineers of the Finance Commission for some time. It was determined some time ago that the antiquated heating system would have to be scrapped and a new one installed, which would centralize its power and operating cost. Mr. Hackett's plan is to dismember the boiler in the carpenter shop and another old one in the hospital and to install two 84-tube boilers, thus making three separate heating plants do the work of the five that are now in operation. The three separate heating plants will be connected in such a way that the plan will closely approach the system called for by the design of the city experts, and will cost $5,000, as against $180,000 which was the estimated cost of an entirely new plant.

Little Rock, Ark.—The Little Rock Gazette, in its issue of December 1, carries a double-leaded editorial calling attention to the cost of the heating and power plant at the State Hospital for Nervous Diseases, which, it is claimed, has cost $108,261, although the entire appropriation made for this work by the legislature was $75,000.

Buffalo, N. Y.—The new system of ventilation used on the surface cars of Buffalo has brought forth numerous expressions of satisfaction, according to President E. G. Connette of the International Railway Co. The system is used on the company's near-side cars. Under the old system, the cold air was admitted at the floor level of the cars where it passed over electric heaters into the cars and thence ascended vertically to the top where it was exhausted through numerous small openings. With the new method four of the upper windows on each side of the car are equipped with buttons which, when pressed to release the lock and pushed, give an opening of 4 in. to admit the outside air. In the rear of the car a louvre window is installed. The

GREETINGS

We wish you unbounded happiness and prosperity during the New Year

More "Reliable" Vacuum Heating Systems were installed last year than during any previous year, and we look for even better business in 1915.

One of the three styles of "Reliable" Heating Systems—the Air Line or Return Line Vacuum or "Vacu-Vapor" System—is particularly suitable for any style or size building from the tallest skyscraper to the bungalow. The "Reliable" is the Universal Line of heating equipment; and the "Reliable" Systems insure most efficient heating results at the minimum fuel cost.

You can save money on the installation if it is a "Reliable" System. You will also be sure of a satisfied customer.

If you have not already installed a "Reliable" System, put in your initial installation soon, and we know you will be so well pleased that you will insist on "Reliable" Systems in the future.

Upon request we will gladly mail you our catalogs and descriptive literature describing any or all of the three "Reliable" Systems.

THE BISHOP-BABCOCK-BECKER CO., GENERAL OFFICES CLEVELAND, O.

conductors have been instructed to open all ventilating windows upon reaching the end of the line. They remain open unless the passengers close them, which is done by a slight push. The best way to gain the good will of car passengers during the winter, in Mr. Connette's belief, is to keep the patrons' feet warm and supply plenty of fresh air.

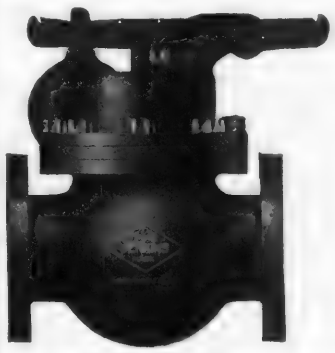
San Francisco, Cal.—The Panama-Pacific Exposition Company, having learned that the heating plant to be built for the Civic Center will not be completed in time to heat the Auditorium during exposition year, has asked the supervisors to allow it to use the lot at Polk and Grove Streets upon which to erect a temporary heating plant.

American Association of Commerce and Trade in Berlin, which is a member of the Chamber of Commerce of the United States, has inaugurated the publication of "Weekly Reports," giving information as to general conditions in Germany during the European war. The prime motive of this effort, it is stated, is to foster the commercial relations between the United States and Germany and the encouragement of mutual business relations. The association says it is firm in its conviction that after peace has been established, the American exporter will find a more ready market and fertile field for his goods in Germany than ever before, and it is the association's desire to maintain and encourage such trade. The "Weekly Report" will be sent regularly to those requesting it on application to the American Association, Equitable Building, Friedrichstrasse 59-60, Berlin, Germany.

Racine, Wis.—The superintendent of schools in Racine is preparing a special course of instruction in heating and ventilating for the janitors of the public schools in that city, which they must take to hold their positions. Instruction will also be given in the reading of air, temperature and humidity recording instruments.

Mobile, Ala.—As the result of a discussion before the Board of School Commissioners, temporary heat will be supplied to the three new schools in Mobile, The Russell, Semmes and Old Shell Road, and a committee of three will be appointed to look into the merits of the different kinds of heating systems and report by June 1, 1915. Stoves will be installed in these schools for the present. A bid of $7,000 for the heating of the three schools was received from L. J. Leahy. The postponement of the award followed the reading of extracts from medical journals favoring natural ventilation.

Chicago, Ill.—In connection with the trial of a street car conductor in Chicago for assault and battery in putting Alderman Ellis Geiger off a North Street surface car under the "back platform" rule, one of the witnesses was Dr. E. V. Hill, of the ventilating division of the city health department, who exhibited a culture of bacteria



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"JENKINS BROS. VALVES, with the DIAMOND TRADE MARK"

and your clients will be certain to obtain good service.

The Jenkins Bros. line includes radiator valves of all kinds, and globe, angle, check, back pressure automatic equalizing stop and check, blow-off—in short, about every type required in the modern plant. Write for our handy catalogue.

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SPECIFY FOXBORO THERMOMETERS

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THE LATEST AND BEST BY EVERY TEST Send for Bulletin No. 73

New York 50 Church St. **The Industrial Instrument Co., Foxboro, Mass.** Chicago Monadnock Bldg.

made from a sample of air taken in a North State Street car, in which there were about 60 passengers, on the day following the Geiger incident. The culture showed 190 different colonies of germs, without counting the germs causing diphtheria, tuberculosis, scarlet fever and such diseases which, he said, he could not reproduce in a test of this sort. Dr. Hill said that there are about 1,800 of the surface line cars of the Monitor type, which is the type used on North State Street, which daily violate the city ordinances in regard to ventilation. These cars have a flat top raised about 10 in. from the body of the cars, with rows of little windows about the top. These are sometimes opened on the theory that they give ventilation, but, according to Dr. Hill, the air coming through these windows circulates only in the top of the car and even passengers standing in such cars do not obtain any noticeable benefit from such ventilators. Now that the ventilation inspectors have practically completed their work in connection with the inspection of the moving picture theatres, Dr. Hill says that they will take up the street car ventilation problem immediately after the first of the year.

Dr. William F. Colbert was the principal speaker before the Co-operative Engineering Society of Mechanics Institute in Rochester, recently, his subject being "Furnace Heating." Dr. Colbert discussed the subject from the standpoint of engineering efficiency, outlining many of the experiments which are carried on under his direction in the scientific laboratory of the Sill Stove Works, of Rochester.

Buffalo, N. Y.—Measured by the standard of the number of persons given employment, the city of Buffalo in 1913 was first in New York State in the manufacture of heating apparatus. The figures are contained in a statement issued by State Labor Commissioner James M. Lynch in connection with the second edition of the industrial directory.

Detroit, Mich.—The heating plant at the Central High School is in urgent need of remodeling, according to Jay R. McColl, consulting engineer of the school board. The school board asked for $70,000 last Spring to remodel the system, but the estimators allowed only $25,000. The present system is about 20 years old.

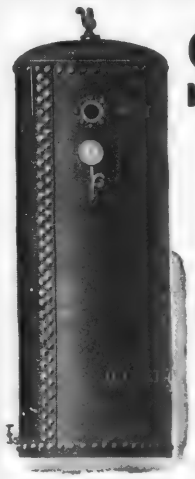
Washington, D. C.—More deaths are occasioned by improper ventilation of railroad coaches and waiting rooms than by train accidents, is one of the statements contained in a report of the committee on railway service and accommodation of the Interstate Commerce Commission, recently published. "The noxious gases," continues the report, "that fill sleeping cars, in connection with the peculiar character of the dust therein, are most conducive to germ breeding where proper ventilation is lacking." While giving the railroads credit for progress in lighting and heating their coaches, the committee says that the lighting, heating and ventilation of waiting and toilet rooms is deplorable. The common form of toilet facilities on trains is denounced as not only "uncleanly and an

"A Radiator Valve that Can't Leak"

is the title of a booklet that should be in the hands of every person interested in any way in heating systems. It contains complete information about radiator valves in general and Detroit Packless Radiator Valves in particular. Ask for booklet V-46.

DETROIT LUBRICATOR COMPANY

DETROIT, U.S.A.



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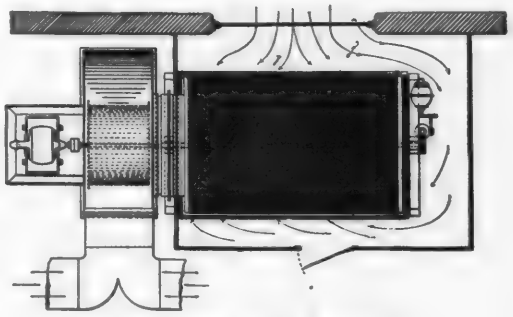

Patented April 13, 1912.
Plan View

KINGWELTON ROTARY AIR PURIFIER

ECONOMY—Nine-tenths less horsepower required than with any other air purifier. Example: A 50,000 cu. ft. purifier requires 1 H. P.

EFFICIENCY—By test, 99% of impurities removed and deposited in bottom of tank.

DURABILITY—Apparatus manufactured at our own works, including the sheet metal work, assuring expert supervision.

Made in dimensions to fit any reasonable location, to purify any volume of air.

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Singer Building	Pennsylvania Depot, Union Station, Pittsburgh, Pa.
National Park Bank	Pennsylvania Depot, Union Station, Washington, D. C.
Breslin Hotel	American Mfg. Co., Greenpoint, L. I.
Flat Iron Restaurant	Independent Order of Foresters, Canada
Residence of Mr. A. G. Jennings	People's Gas Co. Building, Chicago, Ill.

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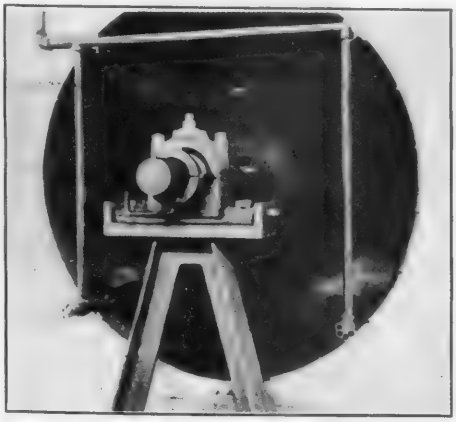
WELLS AND NEWTON COMPANY
Avenue B & 17th Street, New York City

NO EXTRA SPACE NEEDED

for the air washer when you install a



Zellweger Air Washing and Cooling Fan (Patented) in operation showing distributing and sprinkling pipes, water-spreaders and sprays.

ZELLWEGER AIR WASHING AND COOLING FAN

1. Requires only as much space as an ordinary centrifugal fan of equal capacity.
2. Can be installed in suitable units in any part of a building.
3. Blows more air than a standard centrifugal fan.
4. Furnishes more air for equal power than older forms of air washer with any kind of fan.
5. Purifies and cools air more than earlier forms of air washers.
6. Self-cleaning.
7. Four apparati combined in one—blower, purifier, eliminator, circulator.
8. Can be applied to any centrifugal fan.
9. Perfects warm air heating systems and enlarges them into cooling systems.

OUR CATALOGUE GIVES FULL DETAILS

J. ZELLWEGER & SONS
1900 Adelaide Avenue **St. Louis, Missouri**

eyesore, but a menace to the health of the traveling public." Carelessness in providing drinking water at stations and on trains is noted, and it is recommended that railroad commissioners should abolish the stationary water cooler, prescribe a cooler with a portable container, sanitary drinking cups to be provided free of charge for the public, and forbid the placing of ice in the receptacle.

Manufacturers' Notes.

Crane Co., Chicago, Ill., followed its usual custom in the distribution of Christmas bonuses to its employes, the amount distributed totaling $650,000. The bonuses were apportioned on the basis of length of service, efficiency and amount of salary. The company announces the appointment of W. A. Beville as purchasing agent, succeeding the late C. H. Penny, whose death was reported last month. Mr. Beville has been assistant purchasing agent for the company.

Pierce, Butler & Pierce Mfg. Corporation, Syracuse, N. Y., will build a large addition to its present warehouse in the Bronx, New York, abutting the New York Central Railroad tracks at Elton avenue. Alterations are also being made in the main warehouse building to provide for increased facilities.

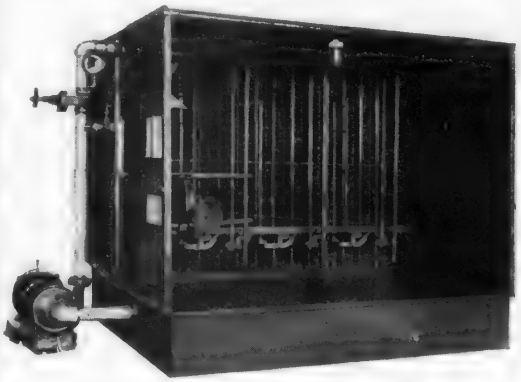
Wm. H. Gallison Co., Boston, Mass., jobbers of heating and plumbing supplies, has moved to new quarters at 401-405 Atlantic avenue. The company had occupied its previous quarters on Oliver street for 35 years.

Buffalo Forge Co., Buffalo, N. Y., reports that Buffalo apparatus were installed in all but one of the buildings in Los Angeles, Cal., for which heating and ventilating contracts were let, as announced in the November issue. These buildings include the Broadway Department Store, Citizens' National Bank Building, Lomanda Park School, Pasadena; Altadena School, Pasadena; Dale Theatre, Pasadena; Maryland Hotel, Pasadena; El Segundo School, El Segundo; Fremont School, Los Angeles; Garvey School, Hoover Avenue School, College Avenue School, Sixty-first Street School; also the Kern County High School, Bakersfield.

Johnson Service Co., Milwaukee, Wis., held the annual convention of its managers and salesmen at the company headquarters' in Milwaukee, December 2-4, inclusive.

Air Washing and Cooling for THEATRES

Our theatre installations prove the "ACME" way gives desired results for Washing and Cooling.

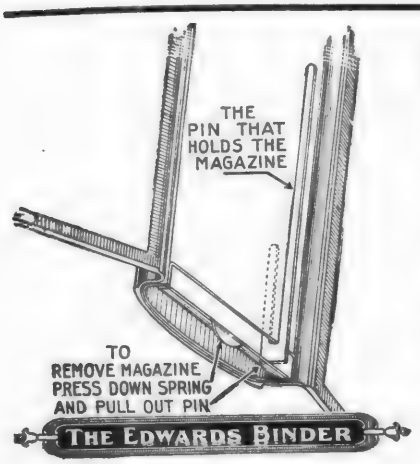


Iroquois Engineering Co.

Manufacturers—"ACME" Air Washers,

CHICAGO, ILL.

Representatives in all principal cities.



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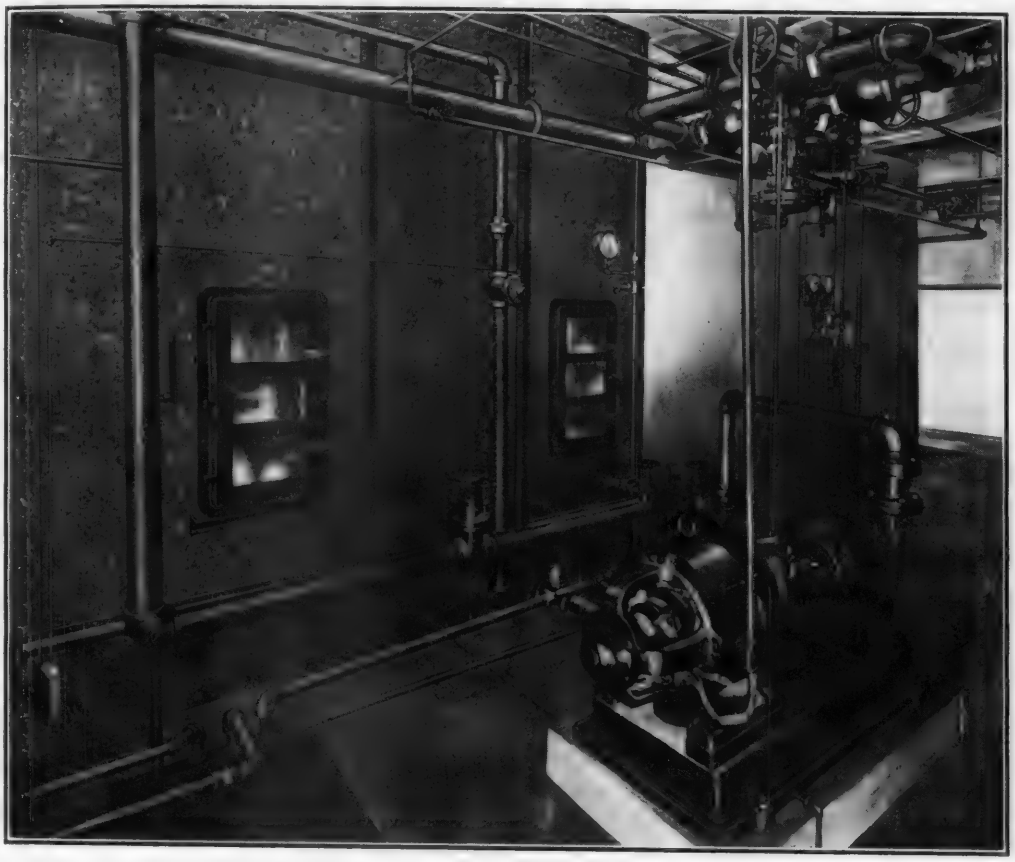

Installation of Webster "Type B" Air Washer Equipped with Humidity Control

Webster Air Washers

Specific Types for Specific Services.
Most Advanced and Complete Selection Available.
The Choice of Discriminating Engineers.

The Webster System of Automatic Humidity Control

Correct in Principle and Extremely Simple.
The Most Practical and Accurate Yet Devised.

Send for new Catalogue "C" before writing your next specification—88 pages of valuable information.
Our complete laboratory and expert assistance at the service of Engineers requiring Air Conditioning Apparatus for special purposes.

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WARREN WEBSTER & CO., CAMDEN, N. J.
Established 1888 **24 Branch Offices**

Various subjects in connection with the business of temperature regulation and humidity control were presented by the members, and these, together with discussions of policies, new apparatus, etc., formed the programme. The pool tournament was won by O. G. Ward, of Cleveland, and C. C. Choffin, of Pittsburg. H. J. Gilson, of Chicago, and F. A. DeBoos, of Kansas City, were seconds. The prize for swimming and diving was awarded to F. A. DeBoos, of the Kansas City office. The convention closed with a banquet at the Hotel Pfister on Thursday evening, December 3. Those in attendance were: H. W. Ellis, president of the company; Carl F. Johnson, vice-president; Paul F. Johnson, secretary and treasurer; B. T. Voute, New York; F. E. W. Beebe, New York; Kennedy Duff, Philadelphia; Stanley E. Plewes, Philadelphia; C. C. Choffin, Pittsburg; W. A. Fenn, Buffalo, N. Y.; F. E. Parker, St. Louis; O. G. Ward, Cleveland; William N. Harding, Indianapolis; C. F. Clarke, Indianapolis; F. A. DeBoos, Kansas City; H. J. Gilson, Chicago; J. A. Cutler, Chicago; C. G. Burritt, Chicago; A. G. Caldwell, San Francisco; George M. Russell, Minneapolis; J. A. Stuart, Denver; J. S. Rice, Cincinnati; H. A. Hamlin, Detroit; C. L. Fortier, Milwaukee, and W. H. Wilson, Milwaukee. Those unable to be present were: Thomas McGrail, Boston; Frank Shay, New York; H. D. Bristol, New York; C. A. Neal, Los Angeles, Cal.; F. A. Sheppard, Dallas, Tex.; John Dunsmore, Toronto, Ont.; J. N. Foster, Seattle, and C. L. Smith, Vancouver, B. C.

Ilg Electric Ventilating Co., Chicago, Ill., states that the location of its new Philadelphia office is at 810 Commercial Trust Building. This is in correction of the address as given in last month's issue.

Wm. Powell Co., Cincinnati, O., reports that Powell valves are used throughout in the heating installation at the newly built Good Samaritan Hospital in Cincinnati; also in this hospital's power and laundry buildings. Powell gate valves are also being used in the installation at the Contagious Hospital in Cincinnati.

Parker Supply Co., New York, in a Christmas greeting circular, states that the Parker Street Metal Works, which is a branch of its business, completed 184 contracts during 1914, in which over 4,000,000 lbs. of sheet metal were used. This, it is believed, establishes a record in the heating and ventilating field.

REFRIGERATING·WORLD

Solves your refrigerating installation and operating problems.

Efficiency engineers charge hundreds of dollars for information contained in REFRIGERATING WORLD which costs ONE DOLLAR a year.

It gives the latest kinks in machinery, appliances, engine, boiler and refrigerating room methods.

"Insulating Material Used in Refrigeration," "The Water End of the Plant," "The Man and the Machine," and "Care of Ammonia Valves" are a few of the valuable articles in the November issue. Send for a copy.

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NOTE THESE NOZZLES

Their construction explains why such a perfect spray is obtained in the

Sturtevant
(REG. U. S. PAT. OFF.)

Air Washer

The large orifice strikes your attention at once—large lumps of foreign matter will pass through quite easily without the least sign of clogging. The orifice is the last word in simplicity—**A pipe with an unobstructed end.**

The spray action is obtained after the water has left the pipe.

This is the great distinction between the Sturtevant and other washers in which **the end of the nozzle is partly plugged up to obtain a spray.** These are apt to clog and require continual cleaning and attention.

Why not look up the other mechanical and operating advantages in catalog 225-V. It is sent on request.

B. F. Sturtevant Company

Hyde Park, Boston, Mass.

and All Principal Cities of the World

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

New Firms and Business Changes.

Weldon & Kelly Co., Pittsburgh, Pa., heating and plumbing contractors, has been dissolved. Joseph A. Weldon will continue the heating and plumbing department of the business at 427 Fourth avenue under the firm name of Weldon & Kelly. The quarters at 305 Wood street, which were occupied by the company for the past 55 years, will be devoted to the chandelier business.

W. Charles Clark, M. E., Cleveland, O., formerly connected for seven years with a prominent paper mill as chief engineer, and later associated as mechanical and electrical engineer with Knox & Elliott, architects, and afterwards with J. Milton Dyer, architect, has opened an office at 250 Rockefeller Building, Cleveland, for the designing and supervising of the installation of complete lighting and power plants, piping, machinery layouts and heating and ventilating systems. A special department for the expert operating supervision of isolated power plants and repairs for same will also be conducted.

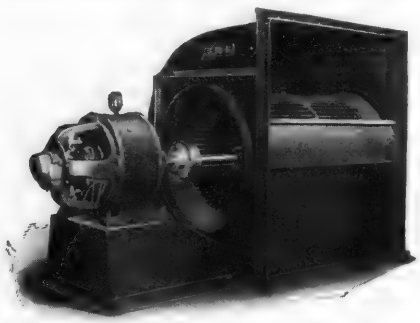
Eadie, Freund & Campbell, New York, have opened an office as consulting engineers at 7 West 45th street. The firm is composed of John G. Eadie, M. E.; Mortimer Freund, E. E., and James B. Campbell, S. B., all of whom formerly constituted the engineering staff of Percival R. Moses, New York. The new firm will conduct a purely consulting engineering business, including the design and supervision of installations for the heating, ventilating, lighting, plumbing, water supply, refrigeration and automatic sprinkling of all classes of buildings; also of complete plants for the efficient production and application of motive power in industrial establishments.

New Incorporations.

Salmon Heater and Contracting Co., Newark, N. J.; capital, $120,000; to manufacture machinery and supplies and to make boilers. Incorporators: R. B. Schmidt, Jr.; J. F. Farrell, of Newark, and J. M. Mitchell, of Orange, N. J.

Roy Wharton Plumbing Co., Louisville, Ky.; to take over the heating and plumbing business of the late Ray Wharton. Incorporators: Elvira Wharton, William O. Quest and Edward L. Quest.

Franklin Co., Canton, O.; capital, $10,000; to manufacture gas radiators. Incor-



Reasons Why

You should specify---

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TRADE MARK.

Multi-Blade Fans and Blowers

1. **Because** they handle twice as much air, consuming less power than paddle wheel fans of same wheel diameter.
2. **Because** their design makes it possible for every bit of energy consumed; produce the maximum amount of air.
3. **Because** their high mechanical efficiency keeps their upkeep costs down to the minimum.

Bulletin No. 109 will be mailed at your request.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN, U.S.A.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Nov. 28/14

Mr. E. E. Leason,
c/o B. F. Sturtevant Company,
Hyde Park, Boston, Mass.

My dear Sir:

Replying to yours of the 20th inst: Owing to brick walls enclosing the machinery, I don't think you could get a good photo of the plant, as we have it in a separate room built of brick and the photographer would be too close to take a good picture. The machinery has been running for about fifteen hours a day in hot and cold weather for about six years, and in that time we have not spent over $8.00 for repairs. I am sure that the slow speed motor is as good as any built.

Yours very truly,

Chas Benner
Supt. of Building.

This letter from a Southern Bank refers to the Heating and Ventilating Apparatus.

PROOF

OF

Sturtevant
(REG. U. S. PAT. OFF.)

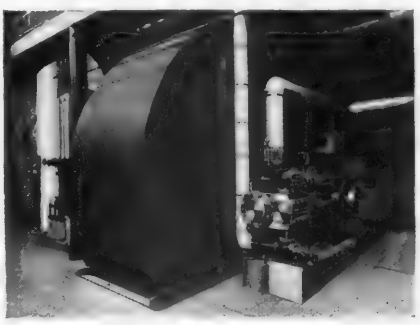
QUALITY

The above is not an isolated case—just one that is typical of hundreds which we receive.

This is the great advantage in equipping a building completely with Sturtevant apparatus.

All apparatus will come in one lot. It will be erected before leaving our shop. It will fit together perfectly and can be erected with speed and ease.

Every day we receive proof such as the above of the satisfaction given by Sturtevant apparatus.



We have the largest body of trained fan engineers in the world. They are at your service with no obligation on your part. Mention this paper when writing.

B. F. Sturtevant Co.
Hyde Park, Boston, Mass.
and all principal cities of the world

porators: J. E. McLain, I. M. Painter, H. A. Staley, C. B. McClintock and A. M. McCarty.

Franklin Controlling Valve Co., Franklin, O.; capital, $10,000; to manufacture heating and plumbing specialties. Incorporators: Howard Fielder, D. W. Fielder, E. M. Thrickfield, C. J. Miller and L. G. Kennett.

Stack Heater Co., Boston, Mass.; capital, $80,000; to manufacture heating boilers. President, Frank L. Tibbetts; treasurer, Chestwood Smith; secretary, Elmer S. Stack.

F. S. Schardein & Sons, Louisville, Ky.; capital, $5,000; to continue the business of the same name. George Schardein has been for some time the general manager of the company.

R. E. Greene & Sons' Co., Cleveland, O.; capital, $3,000; to conduct a heating and plumbing business. Incorporators: R. E. Greene, William A. Greene, Eugene Quigley, W. J. Wilson and N. W. Zimmerman.

Automatic Damper Regulator Co., Los Angeles, Cal.; capital, $15,000. Incorporators: W. S. Casey, H. M. Jack and Mrs. F. Prien.

Ajax Pipe and Boiler Covering Co., Chicago, Ill.; capital, $2,000. Incorporators: Albert F. Kennedy, D. E. Kennedy and R. F. Heinrich.

Business Troubles.

W. D. Newell Plumbing Co., Los Angeles, Cal., has failed, with liabilities of $25,755 and assets of $21,884.

Machinery and Electrical Co., Los Angeles, Cal., has filed a petition in bankruptcy.

Business Chances.

Washington, D. C.—Sealed proposals will be received at the office of the supervising architect, Treasury Department, for the following named work:

Until January 2, 1915, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Bozeman, Mont. Two stories and basement, 4,900 sq. ft. ground area.

Until January 11, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Kinston, N. C. One story and basement, 4,650 sq. ft. ground area.

Until January 14, 1915, for the construction complete, including mechanical equipment, etc., of the medical officers' quarters at the U. S. Marine Hospital at Wilmington, N. C. Two stories, 1,170 sq. ft. ground area.

Westinghouse-Ventura Ventilating Fans

possess the following special features:

High Efficiency—Note the special construction of the fan. This design, together with the high electrical efficiency of the motor, insures the movement of the maximum amount of air for a given amount of power consumed.

Quiet Operation—Suitable for use in churches, hospitals, etc., where noise would not be tolerated.

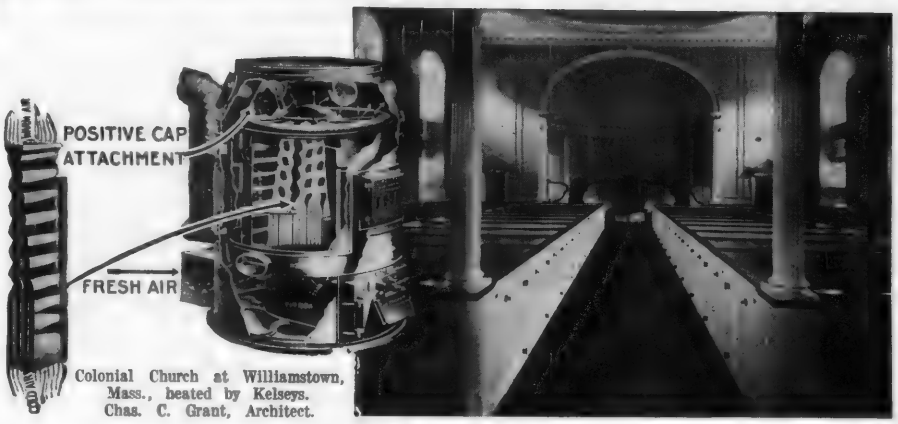
Little Attention Required—An occasional inspection of the motor and lubrication of the bearings is the only attention necessary.

Enclosed Motor—Motor is completely enclosed and protected from dirt, steam, etc.

Compactness—Motor projects but little into the room when fan is installed in wall.

Made in sizes of from 18¾ to 32 inch wheel diameter. Send for publication, giving full description, capacities, dimensions, prices, etc.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.



Colonial Church at Williamstown, Mass., heated by Kelseys. Chas. C. Grant, Architect.

MORE PEOPLE GO TO SLEEP IN CHURCH BECAUSE OF DEAD, REHEATED AIR THAN ON ACCOUNT OF POOR SERMONS

It's the dead, stagnant, reheated air in churches that makes people nod or go home with headaches. Who is to blame? You are, for not getting at the committee and selling them the Kelsey fresh air heat. Suppose you were up against fierce competition—what of it? None of them could guarantee results equal to Kelsey heat. Every one of them burns more coal—or else they give less heat. Either one of the two. Here's a suggestion: The next church job you get a lead on, just let us know and we will work hand in hand with you, tooth and nail. If the committee have any reason in them—the job will be yours. Kelsey Generators heat and ventilate large and small houses, churches and schools with the modern warm air method. Always remember that we help the dealers to help themselves. We stand right by you.

THE KELSEY
WARM AIR GENERATOR

Dealers in all Principal Cities

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2767 Lincoln Ave.

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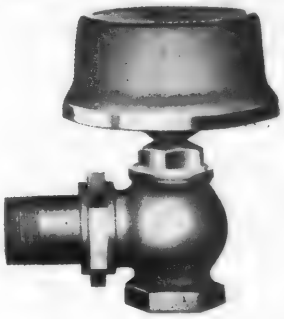
New York,
103 F Park Ave.



Johnson Sylphon Valve

in which the RUBBER diaphragm is replaced by the METAL SYLPHON BELLOWS, which will not vulcanize, crack and leak, reducing the repairs to a minimum and increasing the efficiency and desirability of the Johnson System of Automatic Temperature Regulation.

Write for Booklet.

Johnson Service Company
MILWAUKEE, WISCONSIN

NOTICE—We are the owners of Patent No. 924,235 relating to the automatic control of humidity. Infringers and unlicensed users will be prosecuted.

Until January 15, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Gary, Ind. Two stories and basement, 9,400 sq. ft. ground area.

Until January 22, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Uvaldo, Texas. One story and basement, 4,650 sq. ft. ground area.

Until January 25, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Ennis, Texas. Two stories and basement, 4,000 sq. ft. ground area.

Until January 26, 1915, for the construction complete, including mechanical equipment, of the U. S. Post Office and Court House at McCook, Neb. Three stories and basement, 6,000 sq. ft. ground area.

Until January 29, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Port Office at Chanute, Kan. One story, mezzanine and basement, 4,600 sq. ft. ground area.

Until February 8, 1915, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Tiffin, O. Two stories and basement, 5,800 sq. ft. ground area.

Contracts Awarded.

Southern Illinois Plumbing and Heating Co., Marion, Ill., hot water heating new Illinois Central station at Marion. The plumbing contract went to F. G. Davis & Co., of Marion.

M. J. Gibbons, Dayton, O., heating and plumbing Miami Hotel at Dayton, for $75,000. The installation will include 500 radiators and 300 bathrooms.

Fred C. McClean, Springfield, Mass, heating and ventilating public comfort station at Springfield for $1,992. Other bids were: Wyckoff & Lloyd, $2,014; J. J. Cotter, $2,061; Milner-Bill Co., $2,150, and W. J. Hyland Co., $2,535.

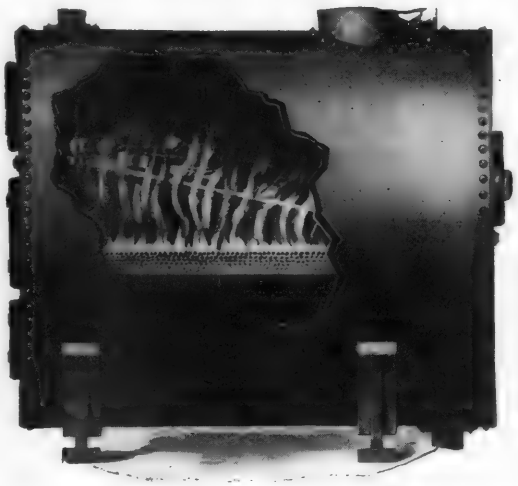
Hanley-Casey Co., Chicago, Ill., heating and ventilating Schenley High School in Pittsburgh.

James Smyth Plumbing and Heating Co., Spokane, Wash., heating, plumbing and power plant for the new hotel in Glacier National Park, for $80,000.

Schmid & Lehrer, Springfield, Mass., heating St. Raphael's Church, for $3,290.

Edward Cornice and Roofing Co., Tacoma, Wash., heating, ventilating and sheet metal work for the St. Joseph Hospital at Tacoma, for $10,000.

You kill two birds with one stone



When you install a

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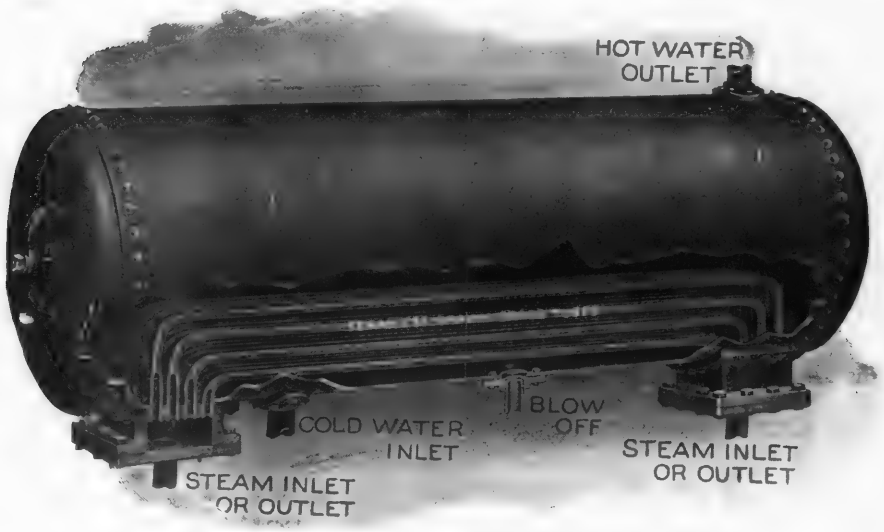

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Cadillac Plumbing and Heating Co., Cadillac, Mich., heating, plumbing and gas fitting for the new United States Post Office Building at Cadillac, for $5,500.

Child & Scott Co., New York, heating new Transit Building in New York.

A. B. Barr & Co., New York, heating residence of C. K. G. Billings at Locust Valley, Long Island.

H. Kelly & Co., St. Paul, Minn., heating and ventilating new railroad building at Fourth and Jackson streets, for $125,000.

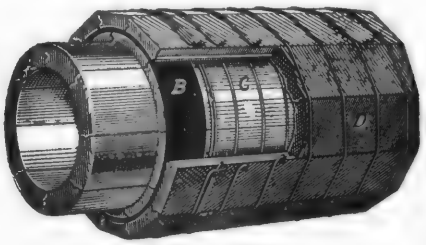
J. J. Cotter Co., Springfield, Mass., heating and plumbing new building for the Lodge of Elks at State and Myrtle streets, Springfield.

Rautman Plumbing and Heating Co., Seattle, Wash., heating and plumbing new hotel building at Post and Columbia streets, for the Yesler estate, for $14,000; also new building for Charles S. Miller, on University street, for $5,200.

Baker, Smith & Co., New York, steam heating new office building at 4-6 West 40th street, New York, being built by Paul Starrett; also heating addition to Harvard Club, on 40th street.

Gillis & Geoghegan, New York, heating new office building at Fifth avenue and 37th street, for the Robert Goelet estate.

General Fire Extinguisher Co., Providence, R. I., heating new dormitory for the State Hospital for the Insane at Providence, for $14,194. The plumbing contract went to E. J. Sullivan, at his bid of $10,820, and the electrical contract to the Rhode



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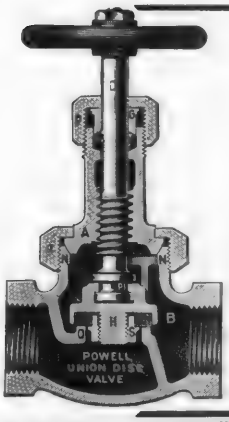

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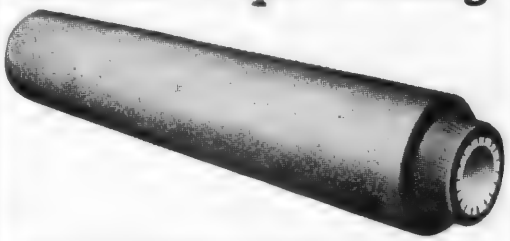

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(2717A)

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C. J. Burke & Son, Kearney, Neb., heating new school building at North Platte.

P. J. Lavan, Seattle, Wash., heating and ventilating new Ballard High School in Seattle, for $33,250.

G. E. Weaverson, Portland, Ore., heating and ventilating Richmond Public School at Portland, for $4,495.

Derheimer Bros., Fort Wayne, Ind., heating and ventilating St. Peter's Cathedral School at Fort Wayne, for $16,000; also heating and plumbing in residence of J. B. Franke, for $5,200.

Barlow Bros. Co., Waterbury, Conn., heating, ventilating and plumbing new municipal building to be built on Grand Street, that city. The contract amounts to $75,000. Also heating new gymnasium building on Thomaston Avenue for the Waterville School District.

W. C. Gidson Co., Louisville, Ky., heating and ventilating new Flat Lick School for $10,787.

Failure of Machinery & Electrical Company

Machinery and Electrical Co., Los Angeles, Cal., has filed a petition in bankruptcy. The debts of the concern, which conducted a contracting business for the installation of heating, ventilating, electrical and plumbing apparatus, are listed at $120,607, of which $111,000 are unsecured and $18,215 accommodation paper. Of the liabilities, $29,159 is due local creditors and $73,466 is due Eastern creditors. The assets are scheduled at $126,295, of which $93,649 is due on open book accounts, $8,120 represents the value of the machinery of the plant, and $15,404 merchandise on hand.

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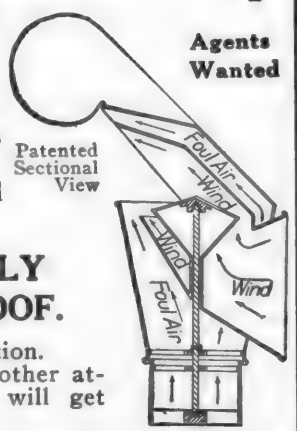

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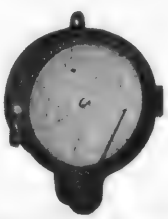

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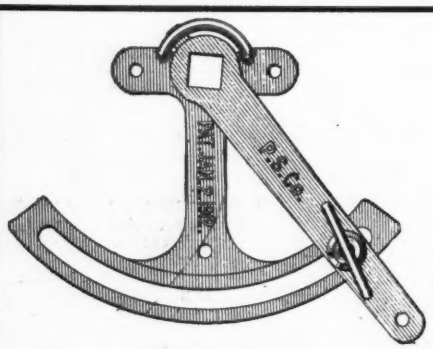

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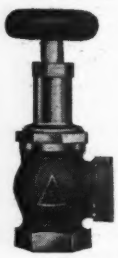

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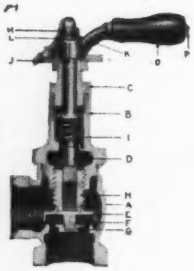

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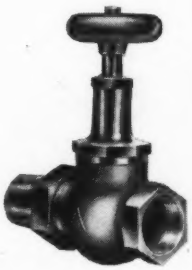

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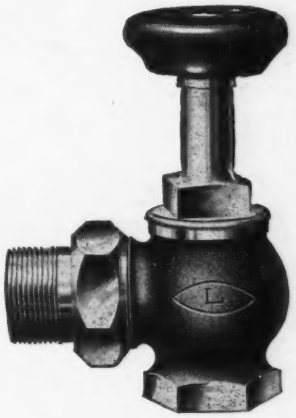

or in peace time, everybody is willing to take off their hats to "The Man Who Delivers the Goods," who is, in other words, efficient. He may be a very commonplace individual, unassuming, quiet, well-mannered, but in time of need he is there. Others may make excuses, but the man we all admire is the fellow who "sees his duty and does it."

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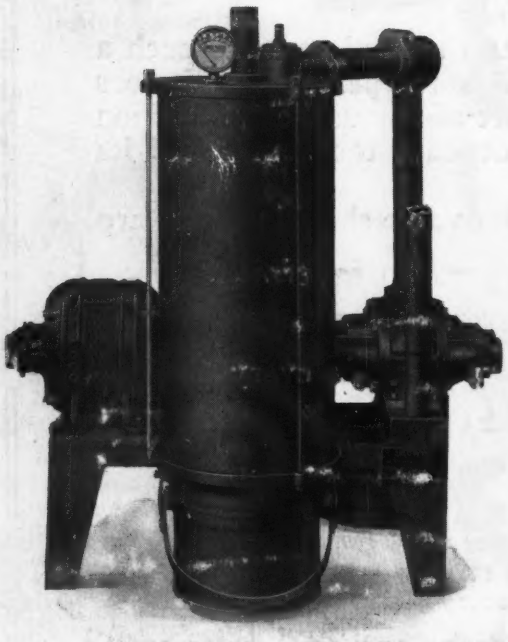

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